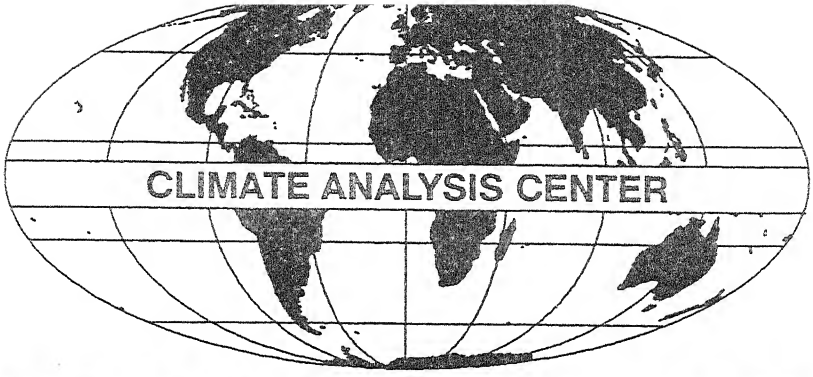
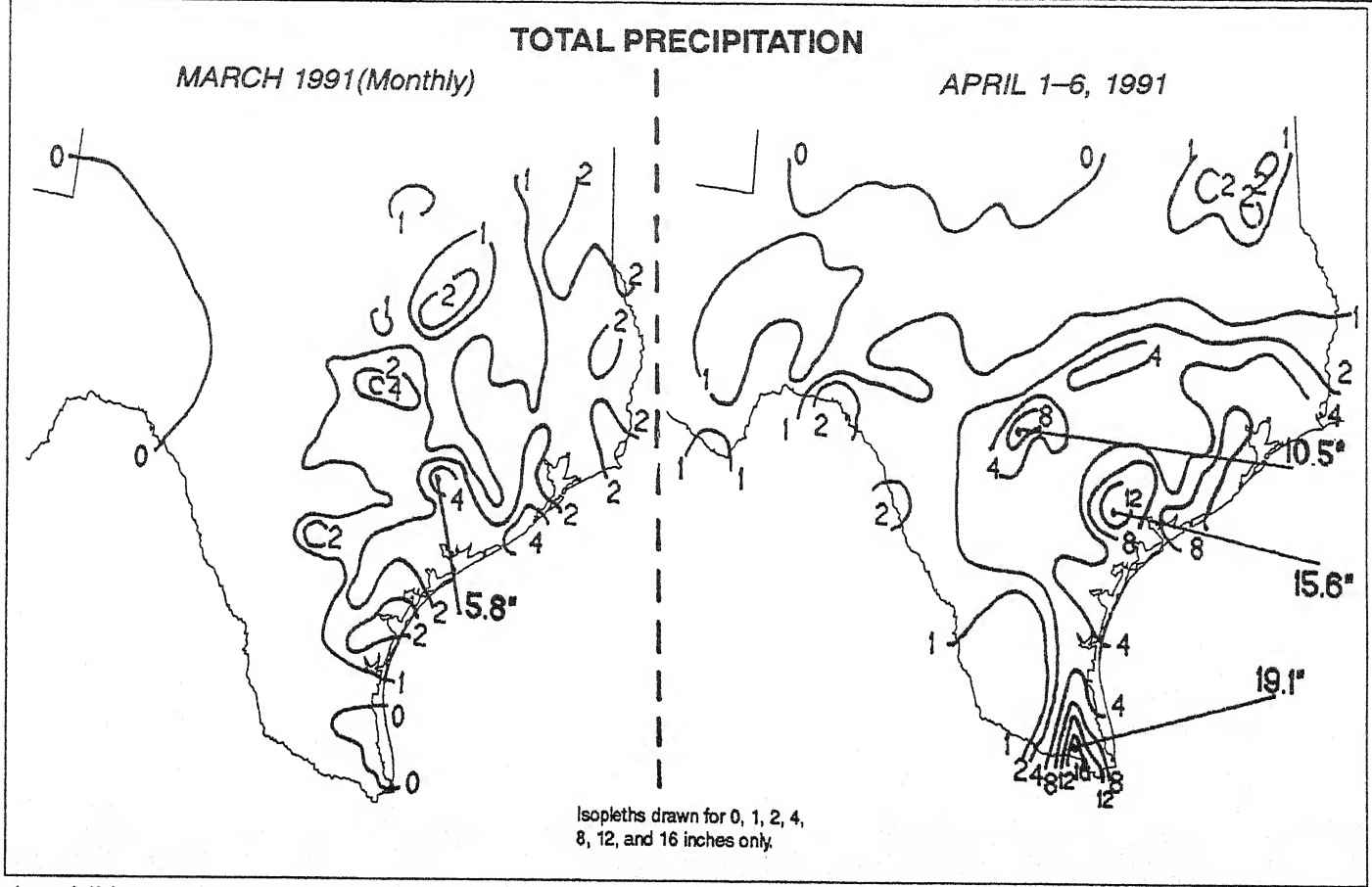


CONTAINS:
MARCH 1991
UNITED
STATES
CLIMATE
SUMMARY

WEEKLY CLIMATE BULLETIN

No. 91/14 Washington, DC April 6, 1991



In addition to the heavy, welcome precipitation across California, March 1991 also brought slightly above normal precipitation to portions of southeastern and south-central Texas, where 1.5 to 3.25 inches normally fall (See United States Monthly Climate Summary). During the first six days of April, however, the southern tip of a cold front stalled across the region and combined with an upper-level disturbance moving eastward from the southern Rockies to generate inundating severe thunderstorms. Up to 19.1 inches of rain deluged extreme southern Texas, most of which fell within 24 hours. The incessant downpours produced widespread urban flooding, sent a number of rivers out of their banks, and caused the evacuation of several lowland locations (See United States Weekly Climate Summary).

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE–NATIONAL METEOROLOGICAL CENTER
CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *U.S. cooling degree days (summer) or heating degree days (winter).*
- *Global two–week temperature anomalies.*
- *Global four–week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three–month precipitation anomalies (once a month).*
- *Global twelve–month precipitation anomalies (every three months).*
- *Global three–month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

STAFF

Editor	Richard J. Tinker
Associate Editor	Tom Heddinghaus
Contributors	Joe Harrison
	Brian K. Hurley
	Paul Sabol
Graphics	Robert H. Churchill
	Alan Herman

To receive copies of the Bulletin or to change mailing address, write to:

Climate Analysis Center, W/NMC53

Attn: WEEKLY CLIMATE BULLETIN

NOAA, National Weather Service

Washington, DC 20233

For CHANGE OF ADDRESS, please include a copy of your old mailing label.

Phone:(301) 763–8071

WEEKLY CLIMATE BULLETIN REQUESTS

☐ **Please ADD my address to your mailing list.**

☐ **Please CHANGE my address on your mailing list.**

☐ **Please DROP my address from your mailing list.**

Name _____

Organization _____

Address _____

City _____ State _____ Zip _____

GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF APRIL 6, 1991

. Central and Southeastern Alaska:

DRIER WEATHER REPORTED.

Little or no precipitation fell across the region. Moisture surpluses were significantly reduced by the dry week across the Aleutians, but remained substantial elsewhere. Two to four times the normal precipitation has fallen in most areas since March 1 [Ending after 5 weeks] .

2. Western United States:

DRIER AND MILDER CONDITIONS PREVAIL.

Most locations across California recorded under 10 mm of precipitation, although totals of 10–40 mm were common in the Sierra Nevadas; however, large precipitation surpluses persisted since late February, particularly in central and southern California, where 2 to 4.6 times the normal amounts have been measured. In addition, up to 245 mm of excess rain has fallen along the south-central coast during the period [6 weeks]. Temperatures also returned to more typical levels, with weekly departures ranging from −1°C along the northern half of the coast to +3°C in parts of the desert Southwest [Ending after 4 weeks].

3 West-Central South America:

ANOMALOUS WARMTH SHIFTS WESTWARD.

Near normal temperatures were reported across most of Argentina, but significant positive departures (+2°C to +4°C) continued to affect central Chile and adjacent Argentina [5 weeks].

4. East-Central South America:

SPOTTY LIGHT SHOWERS OBSERVED.

Light rainfall dominated most locations, with somewhat heavier amounts (15–40 mm) noted across the western tier of the region as well as southern portions of Uruguay and adjacent Argentina. Since late February, shortfalls of 60–155 mm remain across most of the region [5 weeks].

5. Europe:

UNSEASONABLE WARMTH RETREATS SOUTHEASTWARD WHILE POCKETS OF DRYNESS REMAIN.

Moderate precipitation (20–45 mm) fell across the Alps, northern Italy, most of the Balkans, the British Isles, the Northern Iberian Peninsula, western France, and north-central Europe while little or none fell elsewhere. Six-week departures of 40–95 mm have accumulated across most of the region, with scattered shortfalls to 240 mm in Yugoslavia and Italy [Ending after after 16 weeks]. Near normal temperatures were recorded throughout the previously mild areas [Ended after 6 weeks].

6. The Middle East:

INCESSANT MODERATE TO HEAVY RAINS.

During the past three weeks, 50–150 mm of rain dampened most o Turkey and Syria while 35–70 mm fell across affected portions of Ira and Israel. During this period, departures of 50–100 mm hav accumulated at most locations, with surpluses reaching 145 mm a Tehran. In addition, sporadic reports of flooded villages have bee received during the past few months, primarily southeast of th anomalous region near the Iran/Afghanistan border [3 weeks]. Mos of the region has also observed higher than normal temperatures, wit weekly departures consistently in the +2°C to +5°C range [3 weeks]

7 Southeastern Africa:

LITTLE OR NO RAIN ALLOWS REGION TO DRY OUT.

A dry week promoted significant but incomplete recovery from th recent wet spell as sizable six-week surpluses continued [Ending afte 5 weeks].

8. Japan and East-Central China:

MODERATE RAINFALL KEEPS THE AREA TOO WET.

Most of southern Japan and affected sections of southeastern Chin measured 20–60 mm, with slightly higher totals in parts of southeaste Japan and the Ryukyus [8 weeks].

9. The Philippines and Northern Borneo:

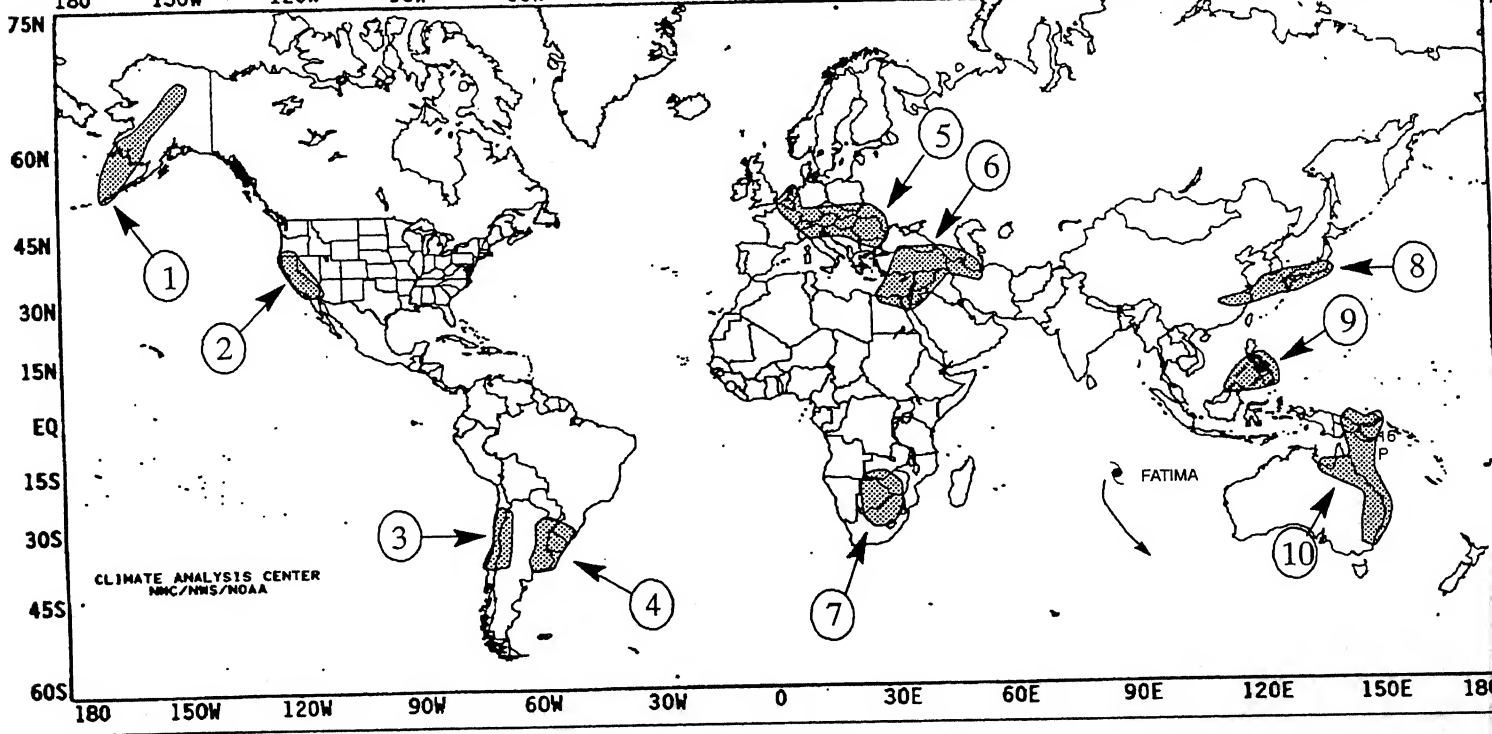
SCATTERED SHOWERS BRING LIMITED RELIEF.

All but northwesternmost Luzon was dampened by 30–75 mm of ra while totals of 20–40 mm moistened the east-central islands, includi Samar. Amounts up to 85 mm soaked isolated Mindanao location but most of that island and Palaway received insignificant rainfall, did northern Borneo [Ending after 18 weeks].

10. Northern and Eastern Australia and Papua New Guinea:

LIGHT RAINS COMBINE WITH DECLINING NORMALS TO DECREASE AUSTRALIAN DEFICITS.

Totals of 20–55 mm fell along the east-central and northeaste Australian coast while little or no rain fell elsewhere. The lig precipitation, combined with diminishing normals as the easte sections of the continent continue towards the dry season, allow six-week deficits to drop. In contrast, significant departures ha developed during the past four weeks across Papua New Guine although accurate data are sparse [Ending after 7 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation and temperature data are this week's values, unless otherwise indicat

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two-week temperature anomalies, four-week precipitation anomalies, longer-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF MARCH 31 - APRIL 6, 1991

Spring-like and occasionally summer-like conditions dominated uch of the country during the week. Unseasonably warm weather revailed across a large portion of the nation, producing high mperatures into the nineties across parts of the Plains and upper lidwest (see Figure 1). More than 100 daily record highs were tablished or tied from the Rockies to New England, with some cations observing highs as much as 40°F above normal. ternational Falls, MN reported a fifth consecutive day of record heat hen the mercury soared to 81°F on Saturday while Yankton, SD ached 93°F, much above the normal high of 53°F. Farther south, ring thunderstorms produced torrential rains across the southern ird of Texas. As much as 19 inches of rain inundated the southern tip the state while over a foot deluged Victoria, TX (see Front Cover). Videspread flash flooding plagued the Texas Gulf Coast from louston to Brownsville and evacuations became necessary in some eas. The San Bernard River overflowed its banks near Brazoria, TX nd the Guadalupe River reportedly rose 15 feet in five hours. Wind usts of 70 mph accompanied one storm that moved through Houston hile another dumped up to 6 inches of hail near Marfa, TX. Heavy ins and high winds also battered parts of the Pacific Northwest. Up 10 inches of rain soaked some locations in western Washington, using flooding and mudslides, while as much as 3.5 inches of rain in 4 hours soaked portions of western Oregon.

The week commenced with relatively tranquil conditions across uch of the nation. A cold front moving across the northern tier of ates dusted parts of the upper Midwest and Great Lakes with snow n Sunday. The front continued rapidly eastward, bringing up to 2 ches of snow to portions of Pennsylvania and New York before oving off the Atlantic Coast. Behind the front, a brief shot of chilly r sank southward out of Canada, briefly settling over the eastern half the nation. Record lows were reported from the upper Midwest to e central Appalachians while frost and freeze warnings were issued r parts of the South and East. In sharp contrast, record warmth revailed in southern Florida on Sunday as readings soared to 90°F hile thunderstorms erupted along a cold front over the central part the state, dumping up to an inch of rain on some areas. Farther west, n area of low pressure over the central Rockies produced wintry nditions in parts of Colorado. The storm system brought up to 5 ches of snow in some areas before moving into the central Plains. evere thunderstorms erupted along the storm's trailing front as it ushed eastward, spawning several tornadoes in Kansas and klahoma. In the Pacific Northwest, a cold front moved onshore, attering the western halves of Oregon and Washington with heavy ins and strong winds.

The last half of the week featured a warming trend across the astern half of the nation. Warm southerly breezes ahead of the storm stem in the central Plains pushed temperatures into the seventies ross the northern Plains and upper Midwest on Wednesday and hursday. The warm air migrated slowly eastward, producing several ozen record daily highs on Friday and Saturday from the Plains to New England. As the Plains' system pushed northeastward, the southern edge of the associated front eventually stalled over eastern Texas. A strong onshore flow of Gulf moisture collided with the front in Texas, producing drenching thunderstorms over southern Texas. Rain fell at the rate of three inches per hour at some locations. Flash floods closed numerous roads near Houston, TX and forced the evacuation of hundreds of residents in Harlingen, TX. As much as 13 inches of rain fell in a 24-hour period at Brownsville, forcing the closure of the airport. Farther west another storm moved into the Pacific Northwest, dumping more heavy rain across western Washington and Oregon while snow blanketed the Cascades. The heavy rains created mudslides and aggravated already-swollen rivers, causing some to spill out of their banks.

According to the River Forecast Centers, the greatest weekly totals (between 3 and 19.1 inches) were measured in south-central and southeastern Texas, the east coast of Florida, the northeastern Mississippi Valley, parts of the central Great Plains, and the western halves of Washington and Oregon (Table 1). Moderate amounts were observed at a few locations in southern and western Florida, the Piedmont, the southern Appalachians, eastern Oklahoma, the middle Mississippi Valley, portions of the central and northern Rockies, northern California, southern Alaska and eastern Hawaii. Light to moderate amounts were recorded across the coastal Plains of South Carolina and Georgia, central New England, western sections of the Ohio Valley, and the remainder of the central Rockies. Little or no precipitation fell on the central Gulf Coast, Tennessee Valley, the remainder of the Ohio Valley and New England, the mid-Atlantic, the Great Lakes, the northern half of the Mississippi River Valley, northern Plains, the High Plains, southern Rockies, the remainder of the northern Rockies, the Southwest, the Intermountain West, the Far West, and the remainders of Alaska and Hawaii.

After a chilly start unusually warm weather enveloped a large portion of the nation. Unseasonably warm conditions across the north-central U.S. produced weekly departures between +15°F and +21°F from the northern Rockies to the upper Midwest as highs soared to 90°F as far north as Wisconsin (Table 2). Weekly departures of +5°F to +14°F were common from the Far West to northern New England. Mild conditions also prevailed across much of Alaska, where weekly departures to +9°F were recorded at Iliamna.

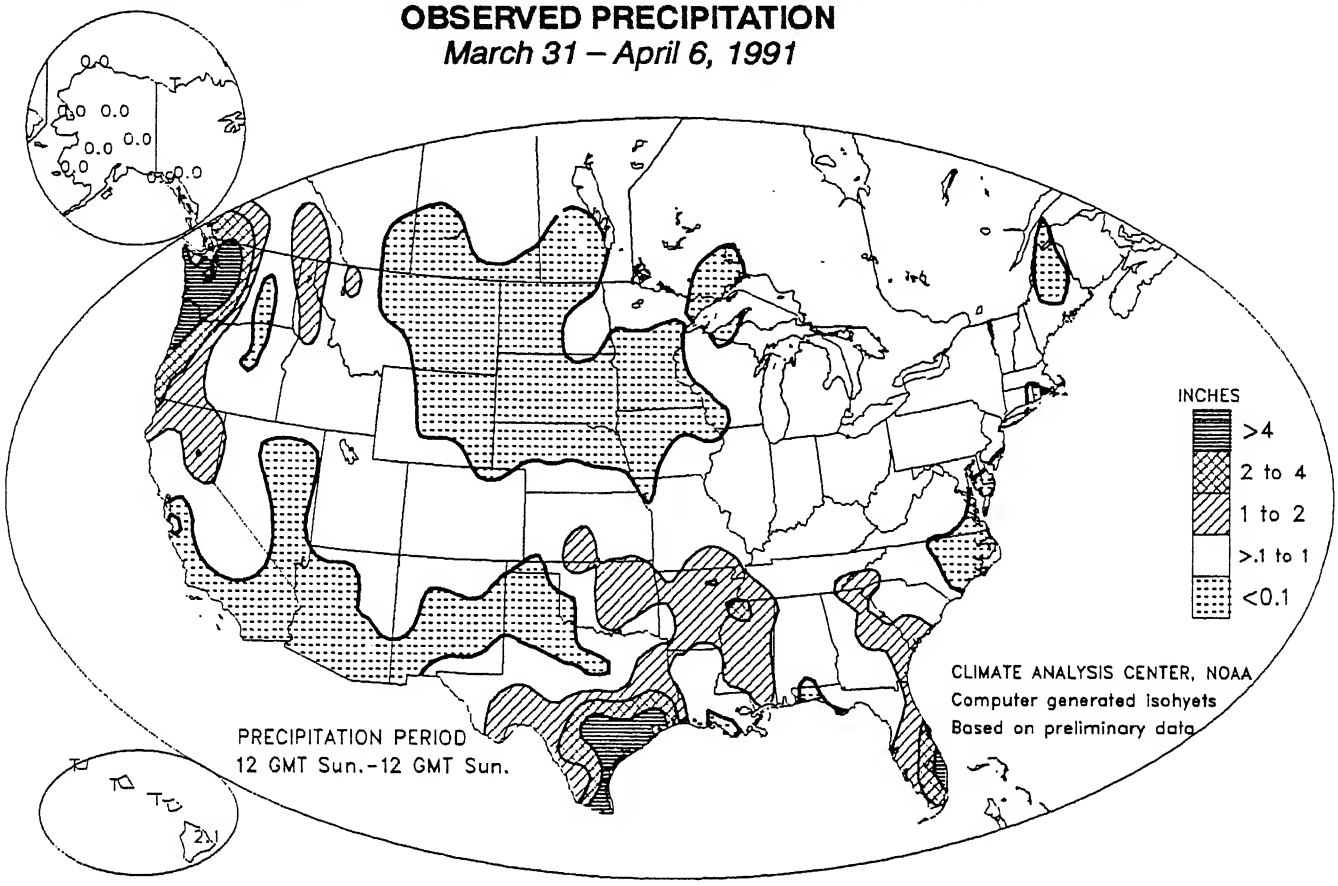
Unseasonably cold conditions early in the week across parts of the eastern and southern U.S. were significant enough to produce slightly below or near normal weekly temperatures from southern New England to the central Florida coast (Table 3). Weekly departures of -3°F were observed at a few locations in the mid-Atlantic, where lows early in the week dipped below 32°F. Unusually cool conditions also covered the southern half of Texas and portions of the central Gulf Coast. Weekly departures as low as -5°F were observed in parts of the Rio Grande Valley. In Alaska, cold weather was confined to the northernmost tier where lows dropped below -20°F at some locations and weekly departures down to -6°F were observed at Kotzebue, AK.

TABLE 1. Selected stations with 3.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
VICTORIA, TX	10.00	SEATTLE-TACOMA, WA	5.12
BROWNSVILLE, TX	9.54	AUSTIN/BERGSTROM AFB, TX	5.00
PALACIOS, TX	8.91	QUILLAYUTE, WA	4.67
ASTORIA, OR	6.28	CORPUS CHRISTI, TX	3.67
OLYMPIA, WA	6.13	SAN ANTONIO, TX	3.64
TACOMA/MCCHORD AFB, WA	5.93	FORT MYERS, FL	3.41
HOUSTON/WM. HOBBY, TX	5.93	MIAMI, FL	3.36
WEST PALM BEACH, FL	5.88	AUSTIN, TX	3.30
TACOMA/FT LEWIS/GRAY, WA	5.29	KINGSVILLE, TX	3.13
VERO BEACH, FL	5.13	ORLANDO, FL	3.10

OBSERVED PRECIPITATION

March 31 – April 6, 1991



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

March 31 – April 6, 1991

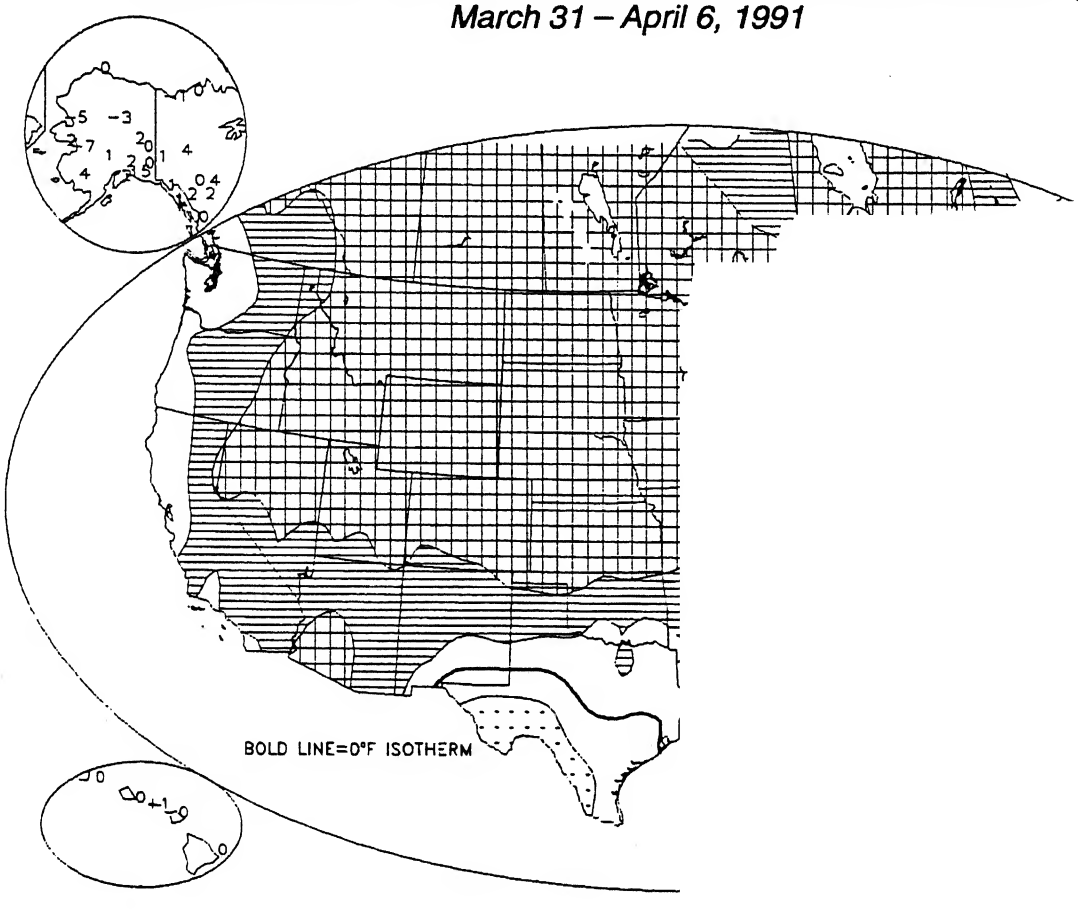


TABLE 2. Selected stations with temperatures averaging 15.0°F or more ABOVE normal for the week.

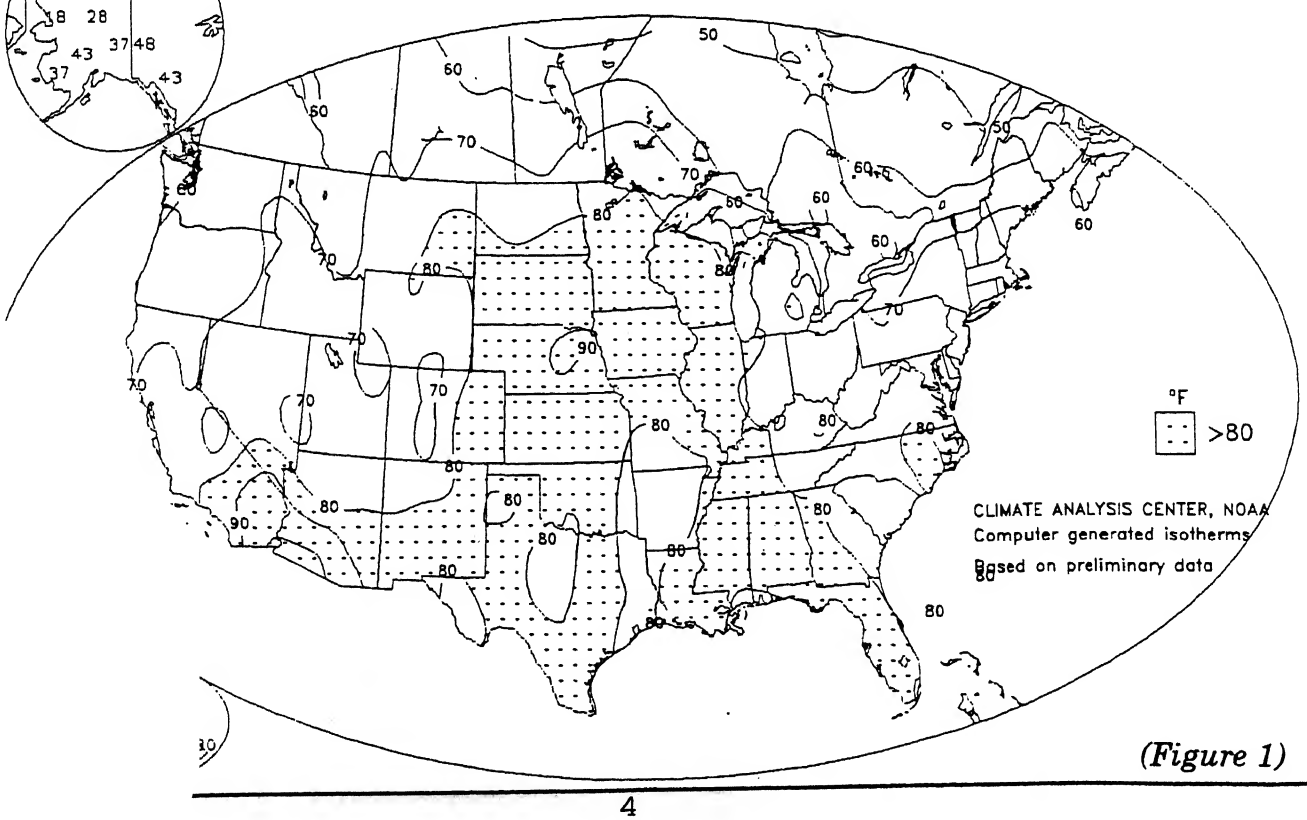
STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
JAMESTOWN, ND	+20.8	55.2	WATERTOWN, SD	+16.9	53.0
GRAND FORKS, ND	+20.1	53.3	SIOUX CITY, IA	+16.3	59.6
FARGO, ND	+19.5	54.6	SIOUX FALLS, SD	+16.2	56.4
MINOT, ND	+19.4	53.6	BISMARCK, ND	+16.2	52.0
DEVIL'S LAKE, ND	+19.1	52.0	INTERNATIONAL FALLS, MN	+16.1	47.3
PIERRE, SD	+18.6	58.7	LINCOLN/MUNI, NE	+15.9	61.0
WILLISTON, ND	+18.5	53.9	BILLINGS, MT	+15.8	55.6
RAPID CITY, SD	+18.3	57.7	GRAND ISLAND, NE	+15.6	59.9
ALEXANDRIA, MN	+18.2	52.8	SHERIDAN, WY	+15.5	53.6
ABERDEEN, SD	+18.0	55.6	LEWISTOWN, MT	+15.4	49.9
MILES CITY, MT	+17.7	56.9	CASPER, WY	+15.3	52.9
DICKINSON, ND	+17.4	52.5	DES MOINES, IA	+15.2	59.4
NORFOLK, NE	+17.3	59.9	LANDER, WY	+15.2	52.9
VALENTINE, NE	+16.9	57.0	NORTH OMAHA, NE	+15.0	61.0
HURON, SD	+16.9	56.0	MINNEAPOLIS, MN	+15.0	54.2
GLASGOW, MT	+16.9	53.7	ROCHESTER, MN	+15.0	53.3

TABLE 3. Selected stations with temperatures averaging 2.0°F or more BELOW normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
KOTZEBUE, AK	-6.0	-0.1	ELKINS, WV	-2.3	43.7
BETTLES, AK	-3.9	9.3	WINK, TX	-2.3	59.2
DEL RIO, TX	-3.4	65.2	CORPUS CHRISTI, TX	-2.2	68.0
SAN ANGELO, TX	-3.1	60.0	KINGSVILLE NAS, TX	-2.1	68.3
SALISBURY, MD	-2.9	47.1	DOVER AFB, DE	-2.0	47.1
HAMPTON/LANGLEY AFB, VA	-2.5	51.3	SAN ANTONIO, TX	-2.0	64.6

EXTREME MAXIMUM TEMPERATURE (°F)

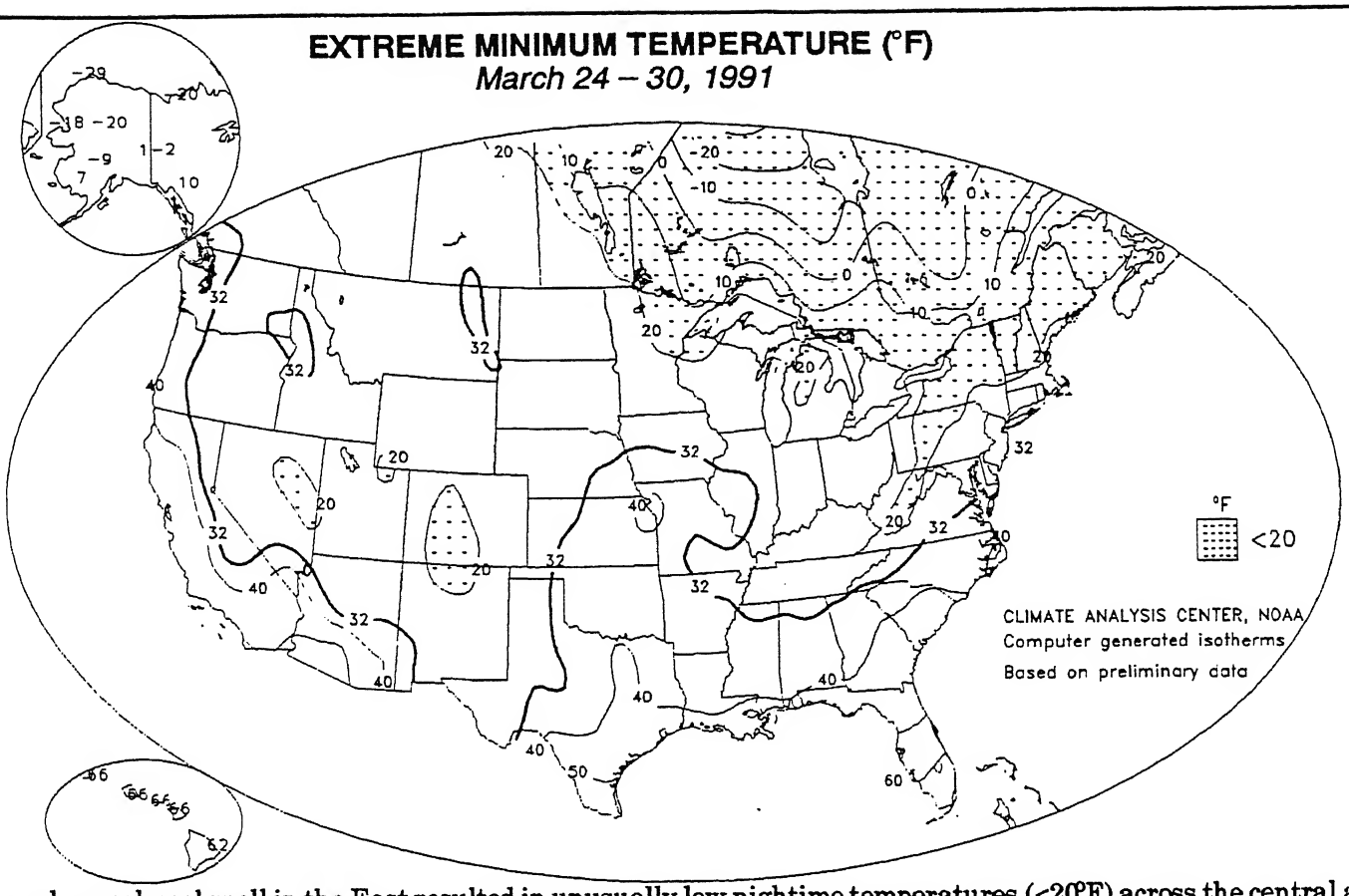
March 31 – April 6, 1991



(Figure 1)

EXTREME MINIMUM TEMPERATURE (°F)

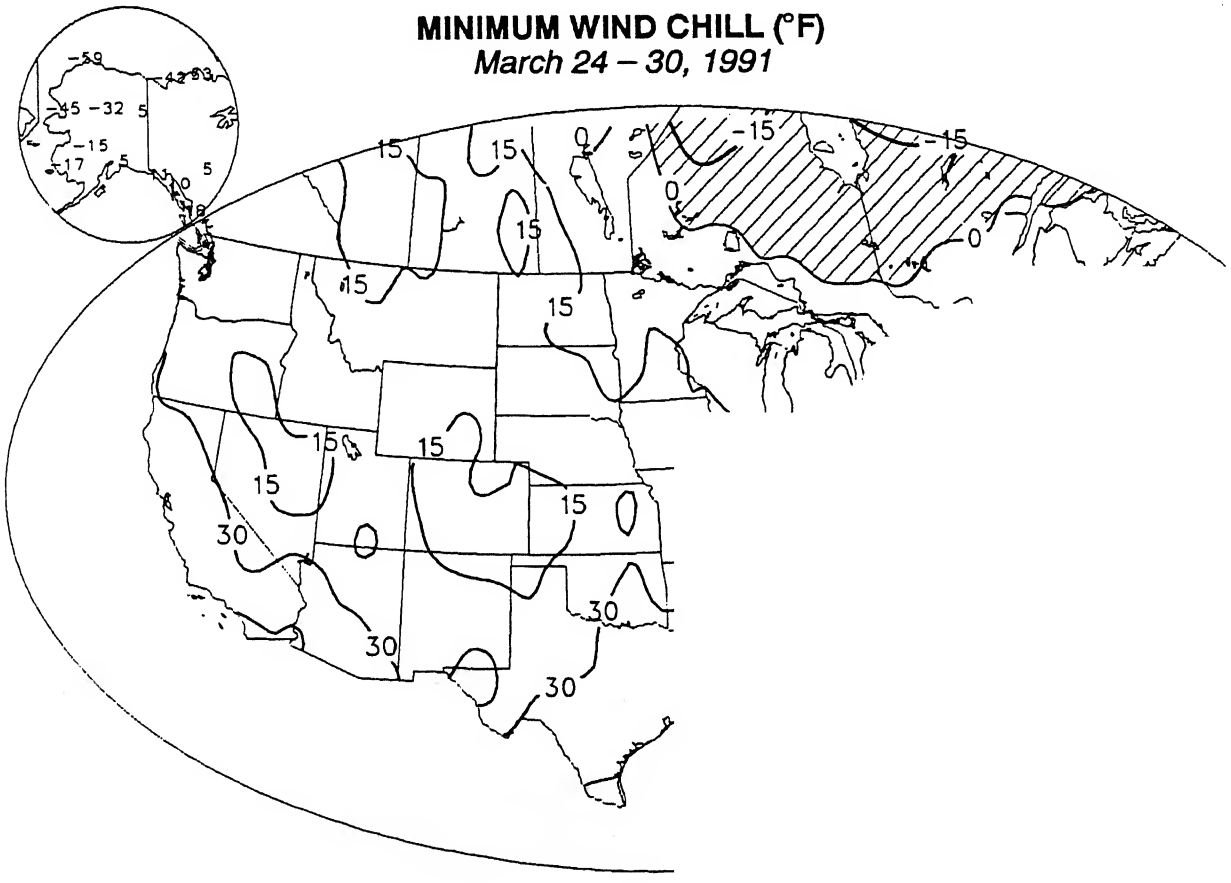
March 24 – 30, 1991



An early–week cool spell in the East resulted in unusually low nightime temperatures (<20°F) across the central and northern Appalachians (top). Since light winds accompanied the chilly air, wind chills across the nation were high during the week, with subzero readings restricted to interior Alaska and Eastern Canada (bottom).

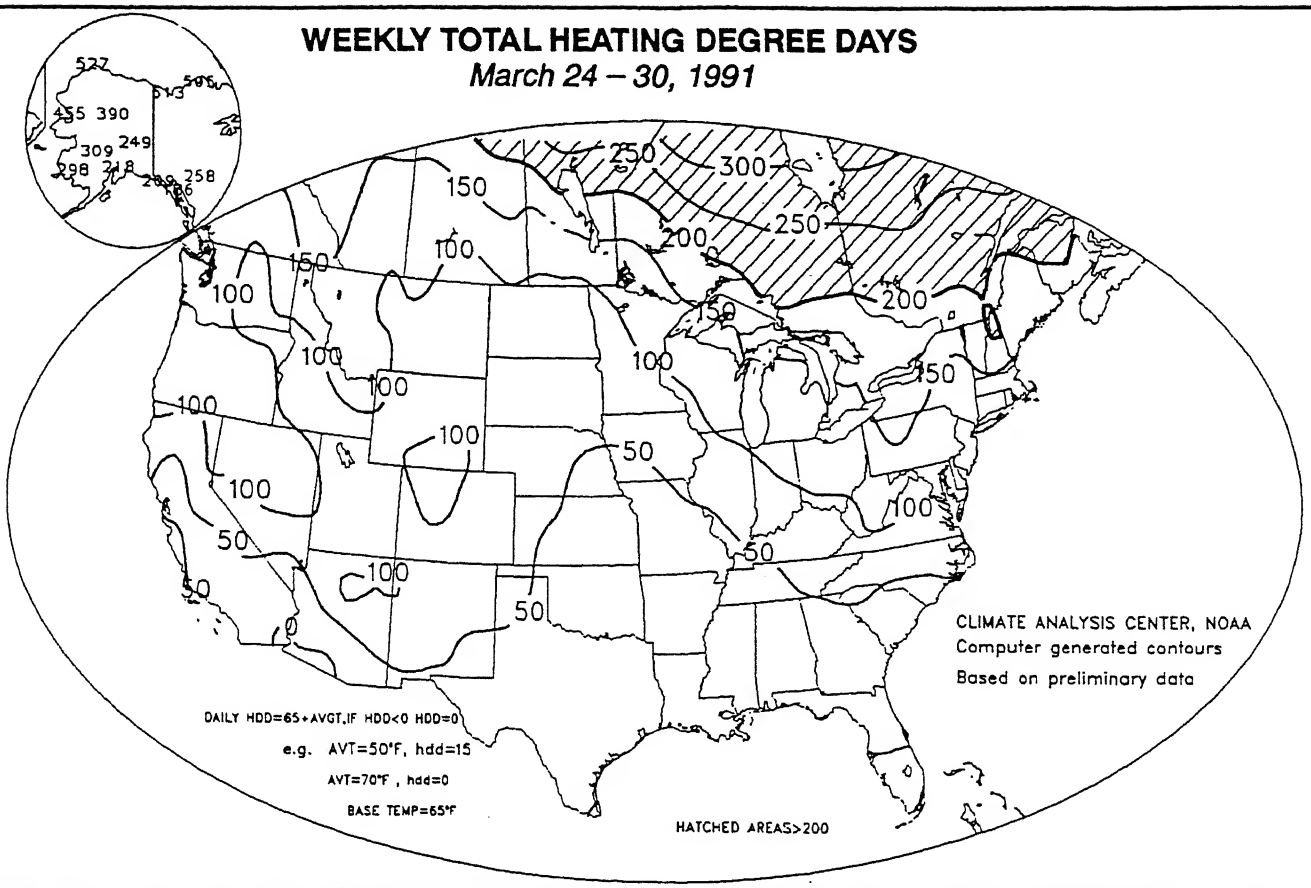
MINIMUM WIND CHILL (°F)

March 24 – 30, 1991



WEEKLY TOTAL HEATING DEGREE DAYS

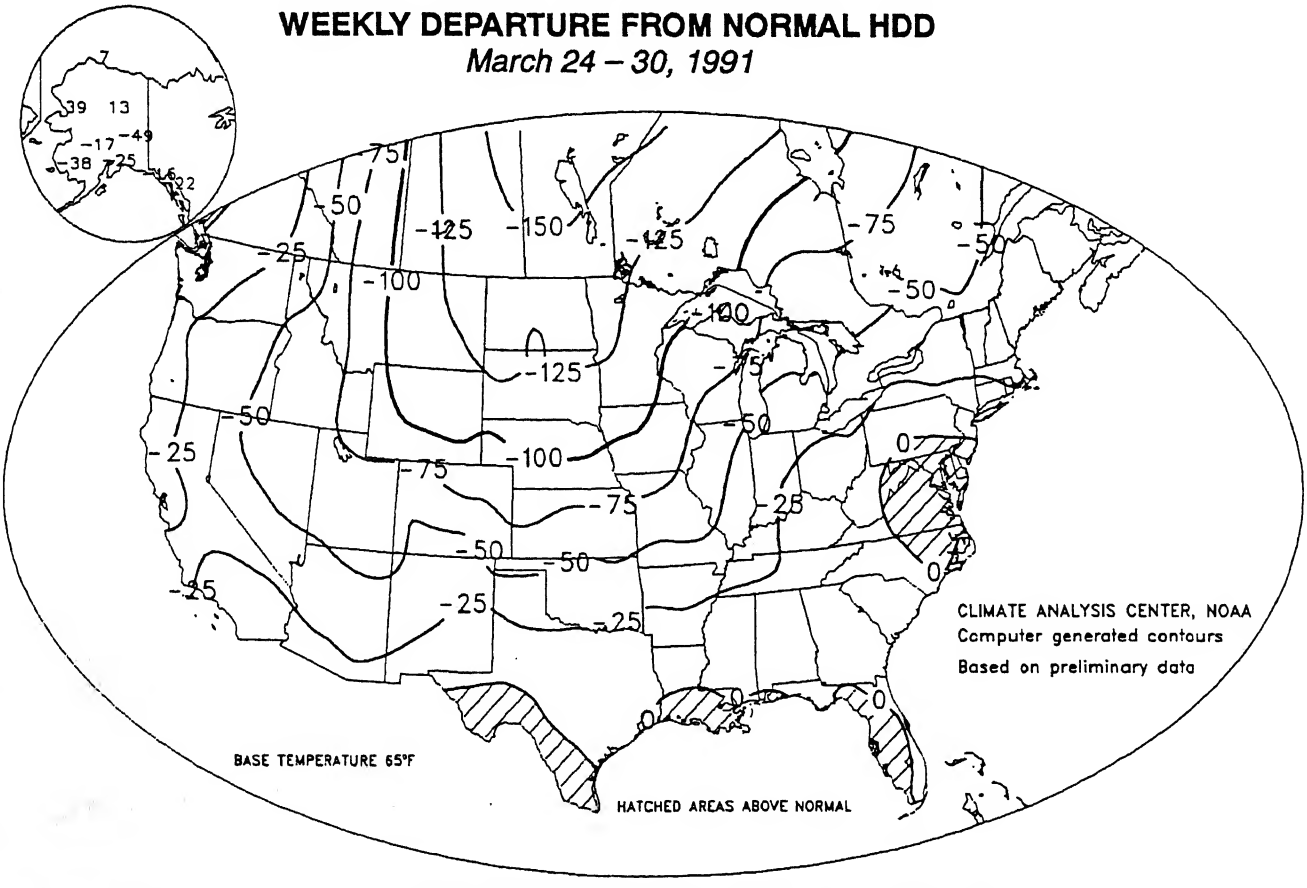
March 24 – 30, 1991



Heating consumption was relatively light as mild air spread through most of the nation during the week. Significant usage (>200 HDD's) was not found in the lower 48 states (top). Despite slightly above normal heating demand generated by an early–week cool spell in parts of the mid–Atlantic, Southeast, and lower Rio Grande Valley, nationwide heating demand was well below normal. Parts of the central and northern Plains measured only one–third to one–half of normal demand (bottom).

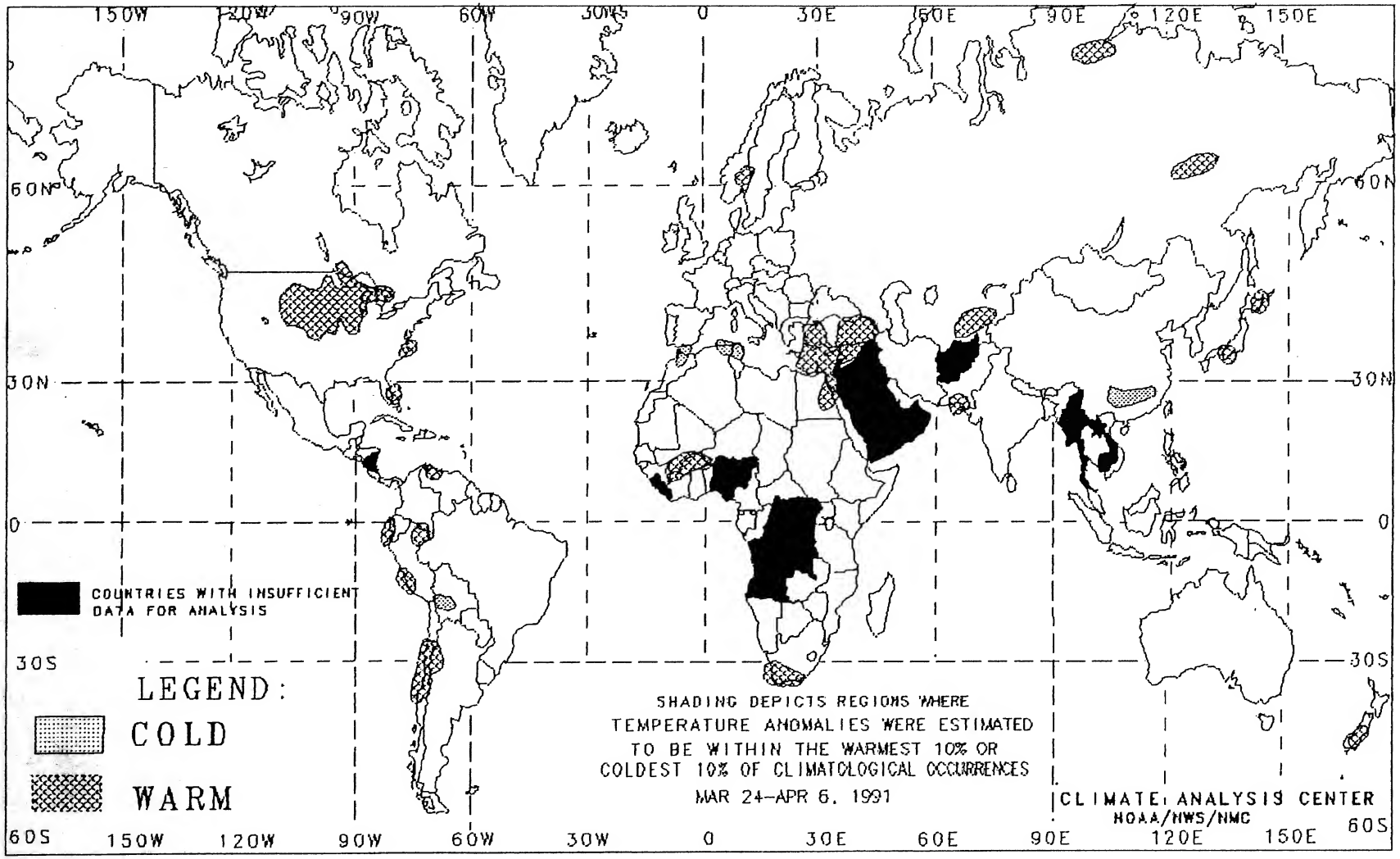
WEEKLY DEPARTURE FROM NORMAL HDD

March 24 – 30, 1991



2–WEEK GLOBAL TEMPERATURE ANOMALIES

MARCH 24 – APRIL 6, 1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty–four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

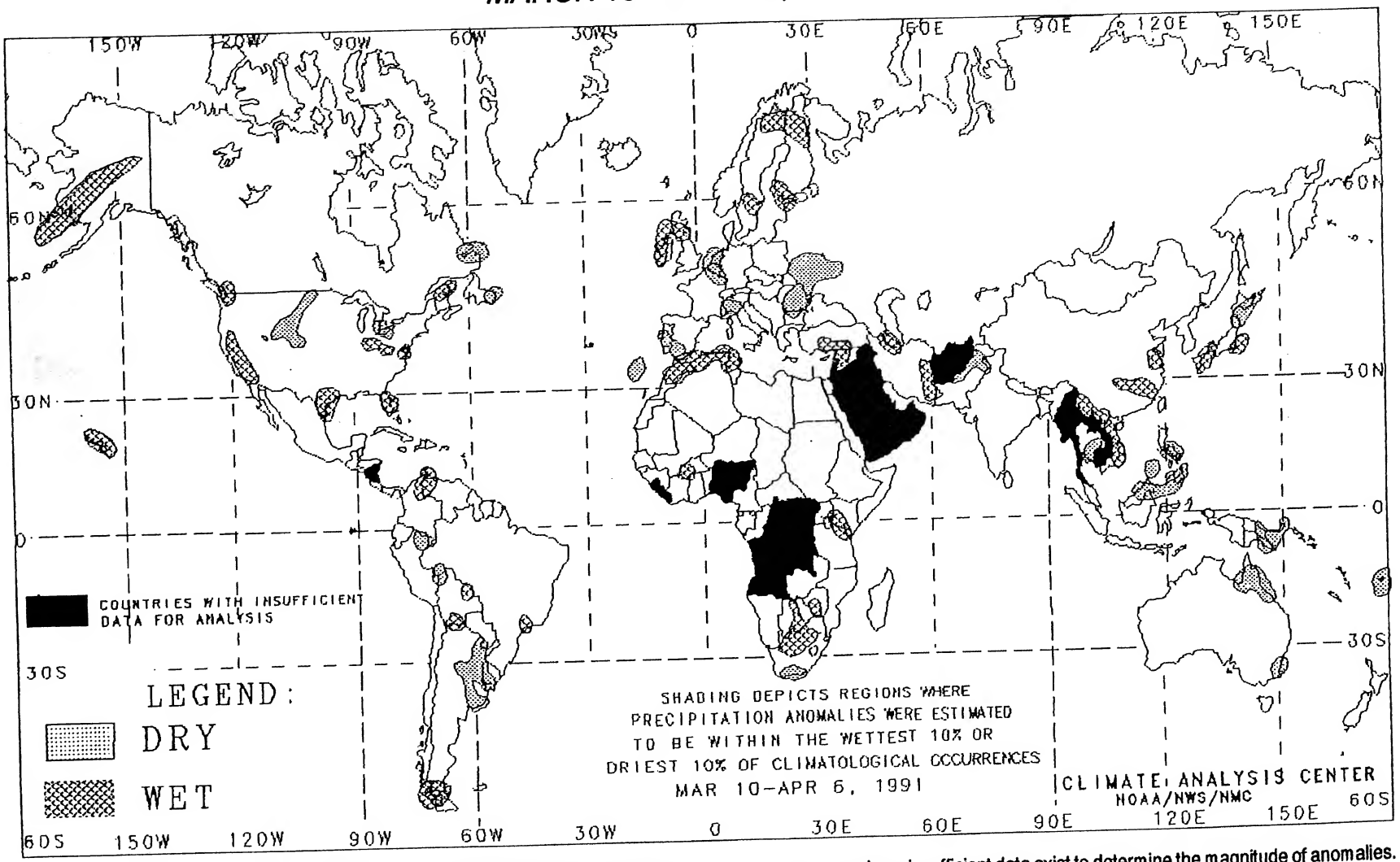
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

4–WEEK GLOBAL PRECIPITATION ANOMALIES

MARCH 10 – APRIL 6, 1991



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

UNITED STATES MONTHLY CLIMATE SUMMARY

MARCH 1991

A series of Pacific storms barreled through the West throughout the month, providing short term drought relief across California, the Great Basin, the Southwest, and the West-Central Rockies. All but the northern tier of California received more than twice their normal precipitation, with more than four times the normal falling across much of the parched southern half of the state. A number of stations reported excessively heavy rains (see Table 1), and several set March records (Table 5). Santa Barbara was soaked by 12.33 inches (5 times normal), making March 1991 the wettest March since records began in 1881. For California overall, this was the third wettest month in the last decade (Figure 9), significantly increasing reservoir levels and mountain snowpack. The state remains under strict mandatory conservation, however, as most reservoirs continue to hold much less water than normal. The total October 1990 – March 1991 precipitation ranks as the ninth driest October–March on record, in spite of the extremely heavy March precipitation (Figure 8). Elsewhere, late winter storms brought a variety of weather conditions and above normal precipitation to most of the area from the eastern Great Plains to the Atlantic coast. Severe thunderstorms battered the Southeast several times during the month, generating large hail, inundating rain, and tornadoes. Farther north, heavy snow and freezing rain paralyzed parts of the Northeast and Midwest during the first of March. In contrast, dry conditions dominated much of the Great Plains, central and southern Rockies, and middle and lower Mississippi Valley, where a number of stations reported less than 70% of normal precipitation (see Table 2).

Spring–like warmth prevailed over the Nation east of (and including) the Rockies. Numerous stations averaged 6°F or more above normal from northern High Plains to the middle Mississippi Valley (see Table 3). Nationwide, temperatures averaged much above the long–term mean (Figure 5), ranking March 1991 as the 26th warmest March on record (records begin in 1895). Figure 5 also indicates that the last seven March's have been warmer than normal. In contrast cool air settled over the western tier of states, particularly through California. Following a couple of subtropical disturbances near the first of the month, the subsequent storm track originated form the Gulf of Alaska, bringing unusually cold weather into California and the Southwest, with temperatures averaging as much as 4°F below normal (Figure 3).

An intense Pacific storm swept into drought stricken California at the cusp of February and March, dumping torrential rain on the southern half of California and much of Arizona. Subsequent storms brought rain and snow to most of California and buried portions of the Great Basin and northern and central Rockies under several feet of snow. Single storm snowfall totals up to 5 feet were reported in the Sierra Nevadas. Stormy weather also blasted the East as heavy rains soaked the Gulf and Atlantic seaboards. Tallahasse, FL received twice the normal March rainfall during the first two days of the month. Farther north, a major ice storm glazed surfaces from Ohio to New England, knocking out power for more than a week in some areas, while heavy snow blanketed the western Corn Belt. Warm air surged northward ahead of these storm systems. More than 30 high temperature records were broken in the East on the first of the month and nearly 3 dozen records fell across the Plains a week latter. The country's first official 100°F reading was reported in Laredo, TX on the 5th, followed by 105°F on the 6th. Temperatures reached into the 90's as far north as Oklahoma City, OK as the heat worsened a rather dry start to the growing season across the central and southern Plains. On the 11th, howling northwesterly winds generated a major dust storm from northern Texas to Nebraska.

Strong storm systems continued to march across the Nation through mid– month. Pacific storms aided reservoir levels and snowpack in California, but brought heavy rains that triggered scattered mudslides. Severe thunderstorms spawned a number of tornadoes in southern California, the southern and central Great Plains, the western Corn Belt and the lower Mississippi and Tennessee Valleys. Heavy snow fell from Minnesota to Maine while ice glazed the valleys of eastern New York. Meanwhile, drenching rains continued to produce localized flooding in the East. Record warmth was again widespread ahead of the storm systems, with over 50 record highs set from the Central Plains eastward. As the month ended, more tornadoes ripped across the upper Great Lakes region and through a corridor from Alabama into North Carolina.

According to the River Forecast Centers, the greatest monthly precipitation (more than 10 inches) was reported in southern Alabama, southern Georgia, northern Florida, from northern Mississippi to western North Carolina, and in the Cascades and Sierra Nevadas of California. Drenching rains of over 10 inches also inundated the big island of Hawaii, where flooding occurred around mid–month. In addition, isolated amounts of over 10 inches were reported in central Arizona, along the coasts of Oregon and California, in the northern Cascades, and along the Alaskan panhandle. Above normal precipitation covered much of the contiguous United States east of the Mississippi and west of the Rockies, as well as Hawaii, Alaska, the western Corn Belt, the northern Rockies, southeastern Texas, and pockets of the Great Plains (Figures 1 and 2, Table 1).

Well below normal precipitation was found in much of the Great Plains and parts of the lower and middle Mississippi Valley and Great Basin (Figure 1, Table 2); however, the bulk of typical year's precipitation falls from late spring through early fall in these areas. The continuing dryness in the central and southern Plains is of particular concern to the hard red winter wheat belt where the October–March 1990–91 precipitation total ranks as the 20th driest such period on record (see Figure 10).

Unseasonably warm conditions again prevailed over much of the country, including Alaska, with two–thirds of the Nation averaging at least 2°F above normal (Figure 3). The warmth was also climatologically significant (> 70th percentile) across almost all of the United States east of the Rockies (Figure 4). Regionally, the Northeast and West North Central had their 14th and 15th warmest March on record, respectively (Table 8). For the country as a whole, the year so far has been unusually warm, with the January–March period ranking as the 11th warmest such period on record. In fact, the January–March period for the last six years has averaged consistently near to above normal (Figure 12). Nine states (CT,NE,NH,NJ,ND,OK,PA,RI, and WY) experienced the tenth warmest of warmer January–March period in 1991, while none ranked among the ten coldest such periods (Table 10).

Subnormal March temperature were limited to the Far West, Southwest and to scattered stations in Alaska and Hawaii. Departure below 2°F were observed only in California, southern Nevada, western Arizona, and a few stations in Alaska (Figure 3, Table 4). The departures were climatologically significant (< 30%) in most of these areas (Figure 4). The West Region had the 24th coldest March since records began in 1895, and was the only region to be in the cooler third of the historical distribution (Table 8).

TABLE 1. SELECTED STATIONS WITH 150% OR MORE OF THE NORMAL PRECIPITATION AND 7.00 INCHES OR MORE PRECIPITATION; OR, STATIONS WITH 9.00 INCHES OR MORE PRECIPITATION AND NO NORMALS DURING MARCH 1991.

STATION	TOTAL (INCHES)	PCT. OF NORMAL
HILO/LYMAN, HAWAII, HI	37.87	279.7
BLUE CANYON, CA	24.28	271.0
TALLAHASSEE, FL	12.55	224.9
VALPARAISO/EGLIN AFB, FL	12.44	225.8
SANTA BARBARA, CA	12.33	507.4
VALDOSTA/MOODY AFB, GA	11.38	***
APALACHICOLA, FL	11.36	281.2
PASO ROBLES, CA	11.28	671.4
CROSSVILLE, TN	10.54	184.6
MACON/ROBINS AFB, GA	10.15	184.9
MACON, GA	10.01	193.6
VALDOSTA, GA	9.97	***
MILTON/WHITING NAS, FL	9.95	***
MARYSVILLE/BEALE AFB, CA	9.90	***
EUGENE, OR	9.79	192.3
LIHUE, KAUAI, HI	9.76	216.9
COLUMBUS/FT. BENNING, GA	9.71	***
REDDING, CA	9.67	195.0
OZARK/CAIRNS AFB, AL	9.63	***
SACRAMENTO/MCCLELLAN AFB, CA	9.55	***
SANTA MARIA, CA	9.41	508.6
MUSCLE SHOALS, AL	9.34	150.2
EUREKA, CA	8.92	177.3
RED BLUFF, CA	8.89	375.1
AUGUSTA, GA	8.51	174.0
GAINESVILLE, FL	8.17	239.6
DAYTONA BEACH, FL	8.11	271.2
GREENSBORO, NC	7.75	200.8
HUNTINGTON, WV	7.71	191.8
ROANOKE, VA	7.58	206.5
JACKSONVILLE, FL	7.33	215.0
FRESNO, CA	7.24	455.4
SAN DIEGO/LINDBERGH, CA	7.20	452.8
VERO BEACH, FL	7.12	233.4
SUMTER/SHAW AFB, SC	7.11	200.9

(Note: Stations without precipitation normals are indicated by asterisks.)

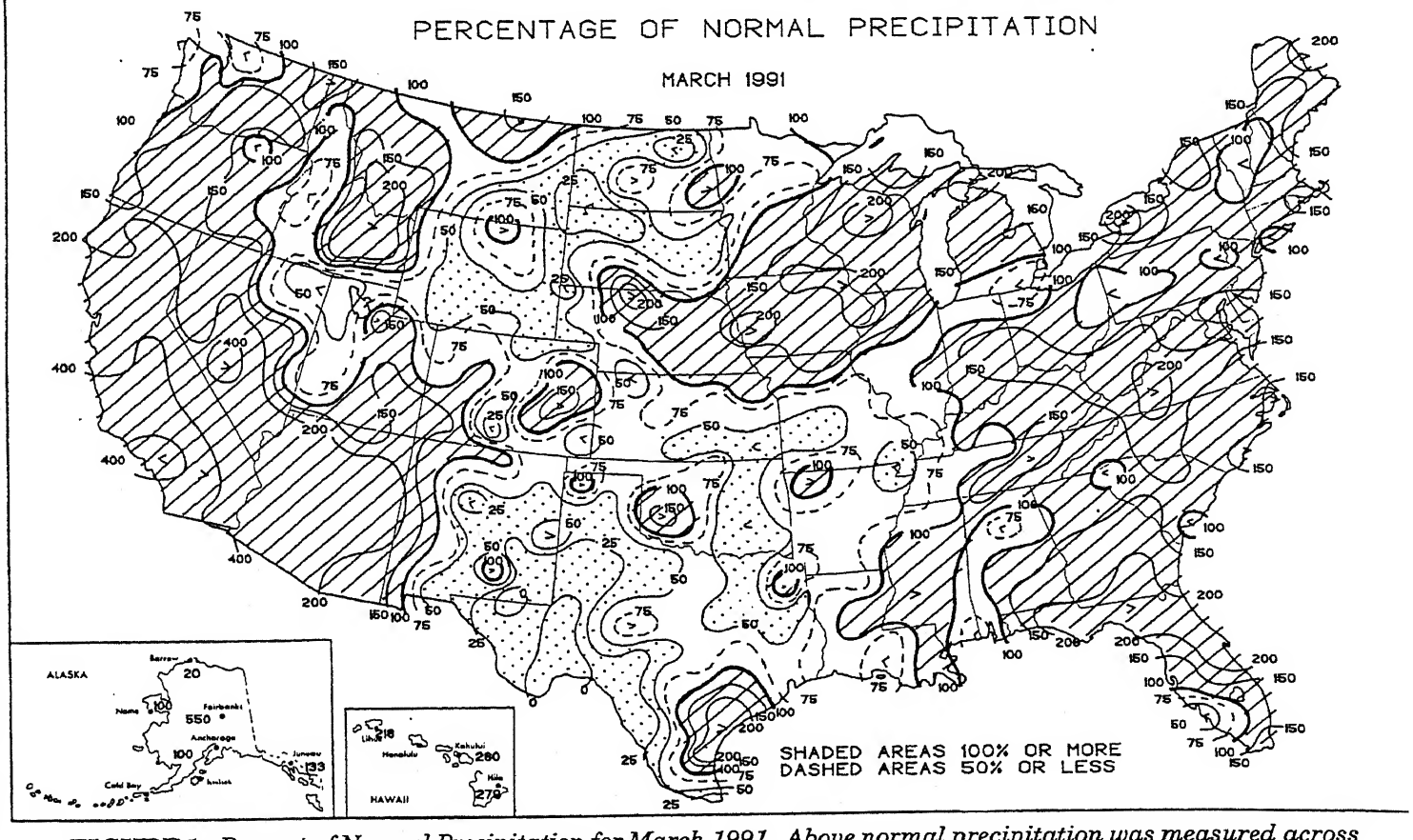


FIGURE 1: *Percent of Normal Precipitation for March 1991. Above normal precipitation was measured across the eastern and western thirds of the country as well as through the Great Lakes and western Corn Belt; however, March was exceedingly dry through northern and southern Plains, particularly through western Texas, although the bulk of the annual normal precipitation falls during the warm season (May–September) in those areas. March 1991 was excessively wet across the Southwest, western Great Basin, and California, where more than 4 times the normal precipitation was observed.*

TABLE 2. SELECTED STATIONS WITH 70% OR LESS NORMAL PRECIPITATION AND NORMAL PRECIPITATION 3.00 INCHES OR MORE DURING MARCH 1991.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)	STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)
KODIAK, AK	0.67	17.0	3.94	BLYTHEVILLE AFB, AR	2.32	47.1	4.92
TULSA, OK	1.02	32.7	3.12	LAFAYETTE, LA	2.72	65.3	4.16
SPRINGFIELD, MO	1.12	32.6	3.44	LITTLE ROCK, AR	2.77	59.4	4.67
ROLLA-VICHY, MO	1.20	35.9	3.36	CAPE GIRARDEAU, MO	3.15	63.1	4.99
LUFKIN, TX	1.41	41.7	3.38	BATON ROUGE, LA	3.21	69.9	4.59
JOPLIN, MO	1.94	64.4	3.01	MONROE, LA	3.28	63.0	5.21
MCALESTER, OK	2.01	52.2	3.85	EL DORADO, AR	3.31	68.5	4.83
WEST PLAINS, MO	2.08	47.9	4.34	MEMPHIS, TN	3.68	68.0	5.41
COLUMBIA, MO	2.13	64.0	3.33	GREENWOOD, MS	3.86	62.1	6.22
JONESBORO, AR	2.22	45.6	4.87				

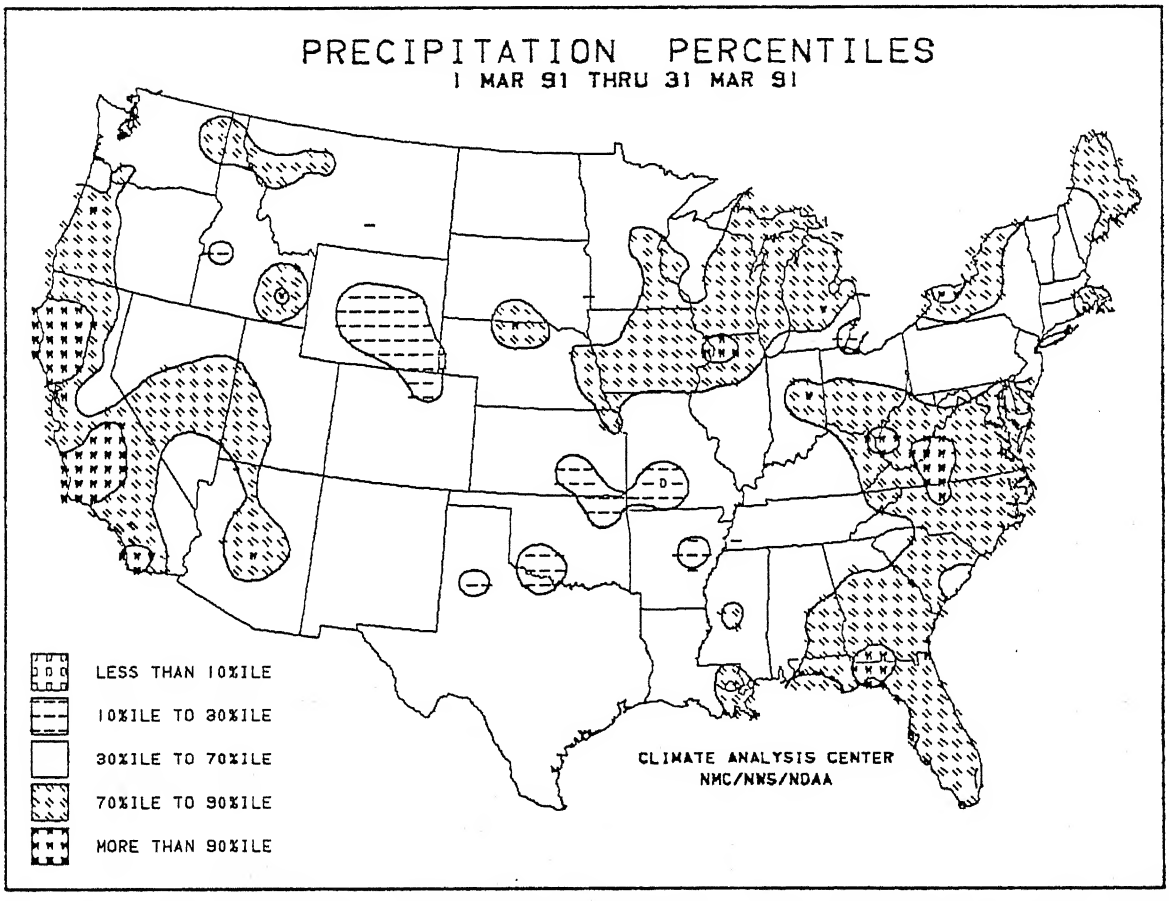


FIGURE 2: *Precipitation percentiles for March 1991. Among the wettest 10% of all Marches was observed in 1991 across parts of California, the upper Midwest, the central Appalachians, and the Florida Panhandle. In contrast, unusually dry weather occurred across sections of the north–central Rockies and south–central Great Plains.*

TABLE 3. MARCH 1991 AVERAGE TEMPERATURES 6.0°F OR MORE ABOVE NORMA

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAG (°F)
LINCOLN, NE	+7.9	44.2	BISMARCK, ND	+6.5	32.7
BURLINGTON, IA	+7.5	44.2	GRAND FORKS, ND	+6.5	28.6
OTTUMWA, IA	+7.5	43.7	TOPEKA, KS	+6.3	48.2
DES MOINES, IA	+7.4	42.4	HURON, SD	+6.3	35.8
ST. LOUIS, MO	+7.0	50.2	MASON CITY, IA	+6.3	35.8
KING SALMON, AK	+7.0	26.4	ABERDEEN, SD	+6.3	33.8
BETHEL, AK	+7.0	18.1	JAMESTOWN, ND	+6.3	30.6
DICKINSON, ND	+6.9	33.5	COLUMBIA, MO	+6.1	48.7
NORFOLK, NE	+6.8	40.5	RUSSELL, KS	+6.1	46.6
MILES CITY, MT	+6.8	38.1	WATERLOO, IA	+6.1	37.9
WILLISTON, ND	+6.7	32.5	GLASGOW, MT	+6.1	33.8
SALINA, KS	+6.5	48.6	FARGO, ND	+6.1	30.4
CONCORDIA, KS	+6.5	46.6	GRAND ISLAND, NE	+6.0	41.9
SIOUX CITY, IA	+6.5	40.3	ALEXANDRIA, MN	+6.0	30.2
SIOUX FALLS, SD	+6.5	37.0	DEVIL'S LAKE, ND	+6.0	27.9

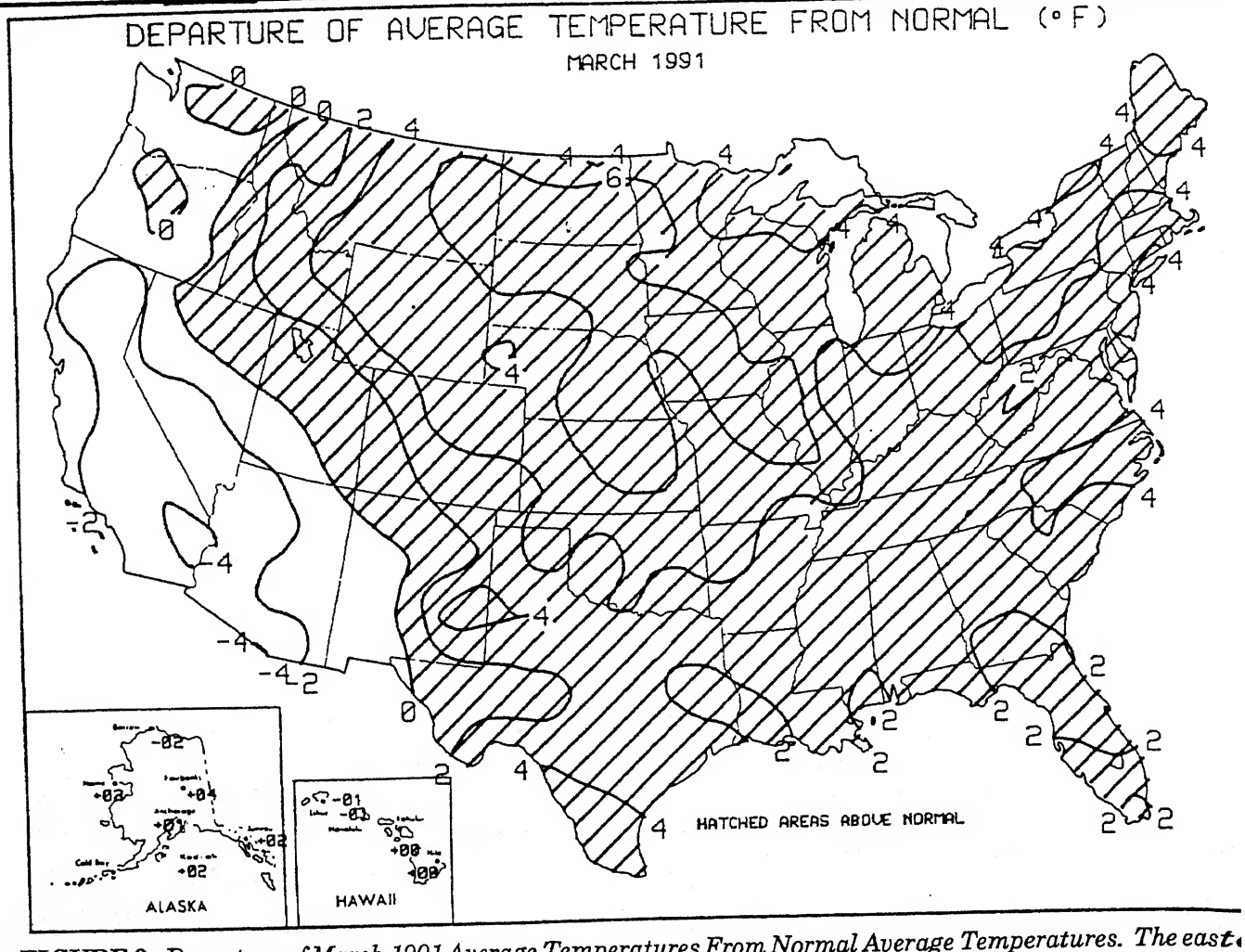


FIGURE 3: *Departure of March 1991 Average Temperatures From Normal Average Temperatures. The east four–fifths of the nation recorded above normal temperatures, with departures exceeding +6°F across portion the northern Plains. Farther west, however, heavy precipitation and associated cloud cover kept temperatu well below normal across most of California, Nevada, and the desert Southwest.*

TABLE 4. MARCH 1991 AVERAGE TEMPERATURES 2.0°F OR MORE BELOW NORMAL.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
REDDING, CA	-5.6	48.7	LOS ANGELES, CA	-2.7	55.0
BLYTHE, CA	-4.9	58.4	TONOPAH, NV	-2.6	37.9
DAGGETT, CA	-4.8	52.7	LONG BEACH, CA	-2.5	56.1
BLUE CANYON, CA	-4.6	33.6	SAN DIEGO/LINDBERGH, CA	-2.5	56.5
BAKERSFIELD, CA	-4.0	53.1	KOTZEBUE, AK	-2.3	-2.5
SAN BERNARDINO/NORTON AFB, CA	-3.9	52.4	TUCSON, AZ	-2.3	55.4
IMPERIAL, CA	-3.8	60.0	FLAGSTAFF, AZ	-2.2	32.4
THERMAL, CA	-3.7	59.8	SEXTON SUMMIT, OR	-2.2	35.4
RED BLUFF, CA	-3.2	50.1	PRESCOTT, AZ	-2.1	40.7
FRESNO, CA	-2.9	51.4	WALLA WALLA, WA	-2.1	43.9
TUCSON/DAVIS-MONTHAN AFB, AZ	-2.9	54.9	DEMING, NM	-2.1	49.0
GLENDALE/LUKE AFB, AZ	-2.8	57.3	SACRAMENTO, CA	-2.0	51.2
LAS VEGAS, NV	-2.7	52.7			

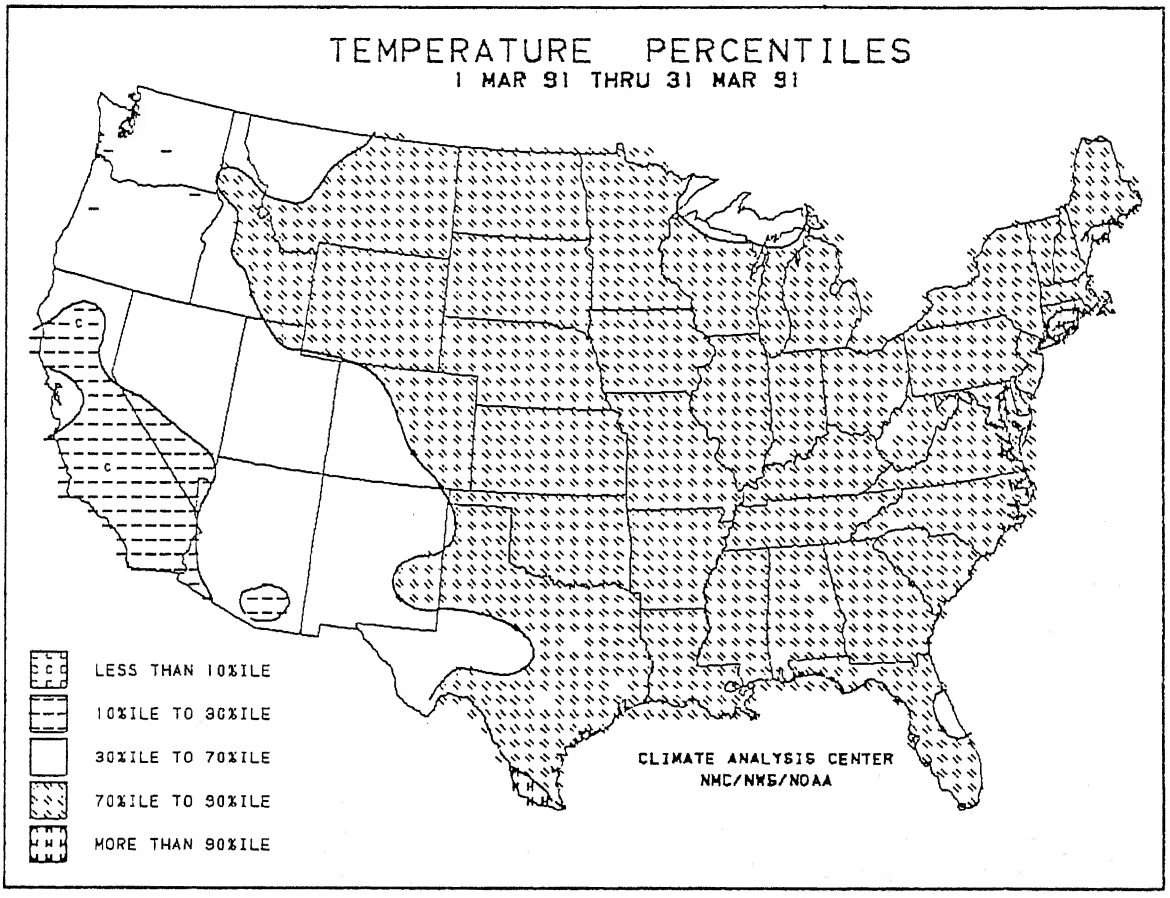


FIGURE 4: *March 1991 Temperature Percentiles. Most of the nation experienced a mild month, with fewer than 30% of previous Marches warmer than March 1991 across the eastern four-fifths of the country. Excessive warmth (percentiles below 10%), however, was restricted to extreme southern Texas. In contrast, only 10 to 30 Marches per 100 could be expected to be colder than March 1991 through California, southern Nevada, and the desert Southwest.*

TABLE 5. RECORD MARCH PRECIPITATION.

STATION	TOTAL (INCHES)	NORMAL (INCHES)	PCT. OF NORMAL	RECORD TYPE	RECORDS BEGAN
SANTA BARBARA, CA	12.33	2.43	507.4	HIGHEST	1881
SANTA MARIA, CA	9.41	1.85	508.6	HIGHEST	1947
DAYTONA BEACH, FL	8.11	2.99	271.2	HIGHEST	1944
HUNTINGTON, WV	7.71	4.02	191.8	HIGHEST	1947
FRESNO, CA	7.24	1.59	455.4	HIGHEST	1947
SAN DIEGO/LINDBERGH, CA	7.20	1.59	452.8	HIGHEST	1940
QUILLAYUTE, WA	6.89	11.97	57.5	LOWEST	1966
BUFFALO, NY	5.97	2.95	202.4	HIGHEST	1947
WASHINGTON/DULLES APT., VA	5.20	3.28	158.5	HIGHEST	1963
BAKERSFIELD, CA	3.74	0.85	440.0	HIGHEST	1947
BETHEL, AK	3.43	0.80	428.8	HIGHEST	1924
MCGRATH, AK	2.83	0.72	393.1	HIGHEST	1941
FAIRBANKS, AK	2.24	0.40	560.0	HIGHEST	1931
KODIAK, AK	0.67	3.94	17.0	LOWEST	1949
MIDLAND, TX	0.00	0.50	0.0	LOWEST	1947
CARLSBAD, NM	0.00	0.33	0.0	LOWEST	1951

Note: Trace precipitation is considered ZERO precipitation. Stations with no precipitation are only included if normal precipitation is 0.25 inches or more.

TABLE 6. RECORD MARCH AVERAGE TEMPERATURES.

STATION	AVERAGE (°F)	NORMAL (°F)	DEPARTURE (°F)	RECORD TYPE	RECORDS BEGAN
TULSA, OK	55.0	49.3	+5.8	HIGHEST	1951
CHARLOTTE, NC	55.2	50.5	+4.7	HIGHEST	1947

TABLE 7. RECORD MARCH EXTREME TEMPERATURES.

STATION	EXTREME (°F)	DATE	RECORD TYPE	RECORDS BEGAN
SAN ANTONIO, TX	100	06 MAR 91	HIGHEST	1940
DALLAS/FT. WORTH, TX	96	05 MAR 91	HIGHEST	1953
KEY WEST, FL	87	31 MAR 91	HIGHEST	1945
LEWISTON, ID	76	31 MAR 91	HIGHEST	1946

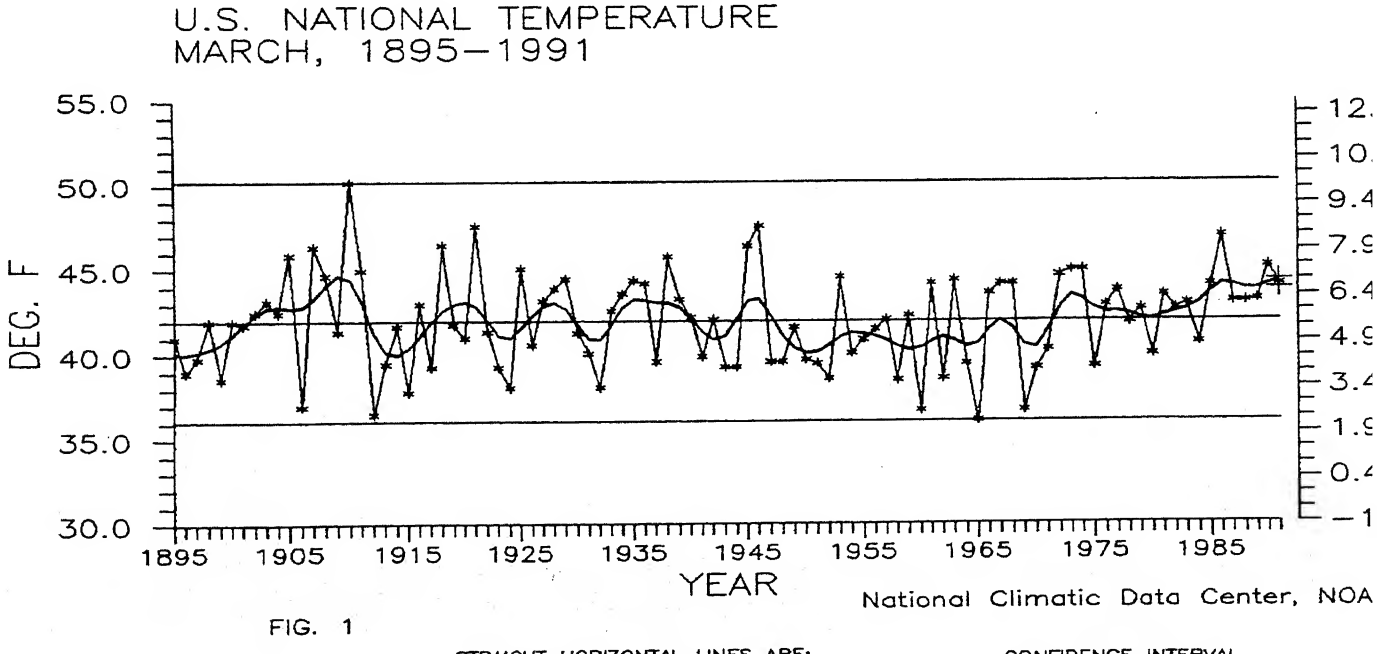


FIG. 1

STRAIGHT HORIZONTAL LINES ARE:
MAXIMUM VALUE (TOP),
LONG–TERM AVERAGE (MIDDLE),
MINIMUM VALUE (BOTTOM)

CONFIDENCE INTERVAL FOR CURRENT YEAR IS INDICATED BY '+'.

FIGURE 5: *United States National Average March Temperature, 1895–1991. March 1991 was the seven consecutive March with above average temperatures nationally, but temperatures were generally lower than tho observed during 1990 (the two sets of crosshairs above and below the March 1991 plot represent expected erro In addition, the solid line, which represents a binomially–filtered trend, has been on the rise since the 198 began.*

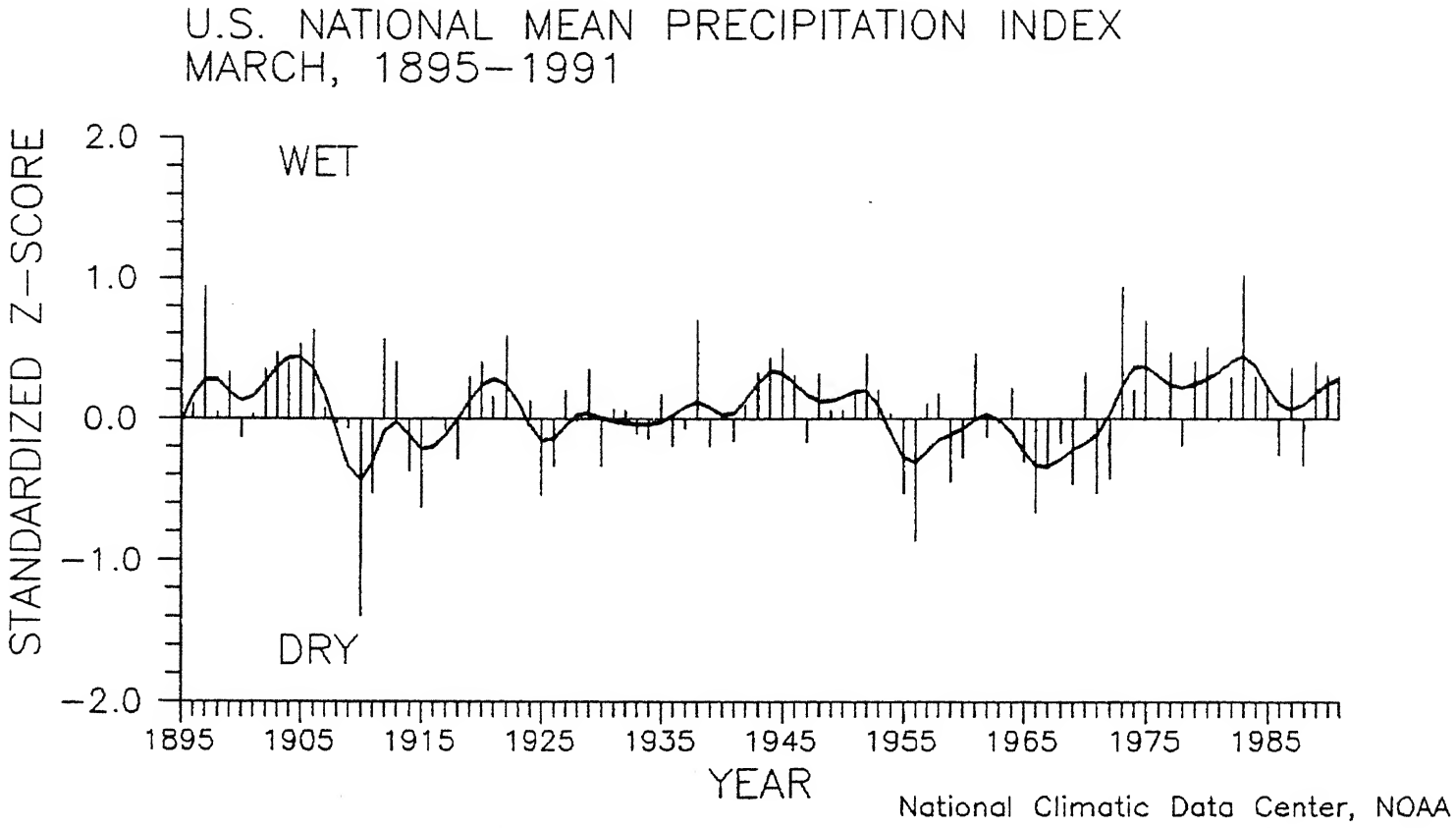


FIGURE 6: *United States National Mean Standardized Precipitation Index, 1895–1991. March 1991 was the third consecutive March featuring above median nationally–averaged precipitation. The solid line, representing a binomially–filtered trend plot, has been above the expected long–term median since the mid–1970's.*

TABLE 8. TEMPERATURE AND PRECIPITATION RANKINGS FOR MARCH 1991, BASED ON THE PERIOD 1895 TO 1991. 1 = DRIEST/COLDEST AND 97 = WETTEST/HOTTEST.

REGION	*PRECIPITATION*	*TEMPERATURE*
NORTHEAST	80	84
EAST NORTH CENTRAL	**92**	76
CENTRAL	60	76
SOUTHEAST	**90**	69
WEST NORTH CENTRAL	33	83
SOUTH	26	75
SOUTHWEST	65	44
NORTHWEST	79	46
WEST	**92**	24
NATIONAL	84	72

National Climatic Data Center

TABLE 9. PRECIPITATION RANKINGS FOR JAN–MAR 1991, BASED ON THE PERIOD 1895 TO 1990. 1 = DRIEST, 97 = WETTEST.

STATE	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*
AL	82	IA	73	NE	67	RI	74
AZ	75	KS	19	NV	38	SC	77
AR	20	KY	60	NH	20	SD	33
CA	55	**LA**	**90**	NJ	69	TN	57
CO	*7*	ME	48	NM	33	TX	70
CT	34	MD	67	NY	43	*UT*	*7*
DE	70	MA	39	NC	60	VT	16
FL	**94**	MI	50	ND	22	VA	75
GA	**94**	MN	50	OH	46	WA	46
ID	12	MS	80	OK	20	WV	78
IL	36	MO	20	*OR*	*10*	WI	81
IN	46	*MT*	*9*	PA	35	*WY*	*1*

National Climatic Data Center

Top 10 rankings : **BOLD** Bottom 10 rankings : *Italics*

TABLE 10. TEMPERATURE RANKINGS FOR JAN–MAR 1991, BASED ON THE PERIOD 1895 TO 1991. 1 = COLDEST AND 97 = WARMEST.

STATE	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*	*STATE*	*RANK*
AL	63	IA	76	**NE**	**88**	**RI**	**92**
AZ	65	**KS**	**89**	NV	70	SC	71
AR	62	KY	80	**NH**	**94**	SD	82
CA	58	LA	57	**NJ**	**90**	TN	72
CO	61	ME	65	NM	58	TX	66
CT	**91**	**MD**	**88**	NY	86	UT	47
DE	79	MA	86	NC	80	**VT**	**93**
FL	82	MI	80	ND	87	VA	87
GA	67	MN	78	OH	80	WA	71
ID	77	MS	69	OK	87	WV	73
IL	74	MO	69	OR	75	WI	75
IN	77	MT	85	PA	87	**WY**	**91**

National Climatic Data Center

Top 10 rankings : **BOLD** Bottom 10 rankings : *Italics*

TABLE 11. STATISTICS FOR SELECTED RIVER BASINS: PRECIPITATION RANKING FOR OCT '90–MAR '91 , WHERE 1 = DRIEST AND 96 = WETTEST, BASED ON THE PERIOD 1895 TO 1991; AREAL PERCENT OF THE BASIN EXPERIENCING SEVERE OR EXTREME LONG–TERM (PALMER) DROUGHT, AND AREAL PERCENT OF THE BASIN EXPERIENCING SEVERE OR EXTREME LONG–TERM (PALMER) WET CONDITIONS, AS OF MARCH, 1991. RIVER BASIN REGIONS AS DEFINED BY THE U.S. WATER RESOURCES COUNCIL.

RIVER BASIN	PRECIPITATION RANK	% AREA DRY	% AREA WET
Missouri Basin	20	43.3	.0
Pacific Northwest Basin	33	47.5	.7
California Basin	*9*	8.8	.0
Great Basin	*4*	74.0	.0
Upper Colorado Basin	18	68.4	.0
Lower Colorado Basin	70	:0	.0
Rio Grande Basin	59	1.6	3.9
Arkansas–White–Red Basin	33	8.7	.0
Texas Gulf Coast Basin	60	.0	.0
Souris–Red–Rainy Basin	20	56.9	.0
Upper Mississippi Basin	76	.0	12.7
Lower Mississippi Basin	**90**	.0	5.5
Great Lakes Basin	**94**	.0	53.7
Ohio River Basin	**95**	.0	63.2
Tennessee River Basin	**96**	.0	60.4
New England Basin	85	.0	7.7
Mid–Atlantic Basin	**87**	.0	13.8
South Atlantic–Gulf Basin	**88**	4.0	6.9

Top 10 Rankings: **Bold** Bottom 10 Rankings: *Italics*

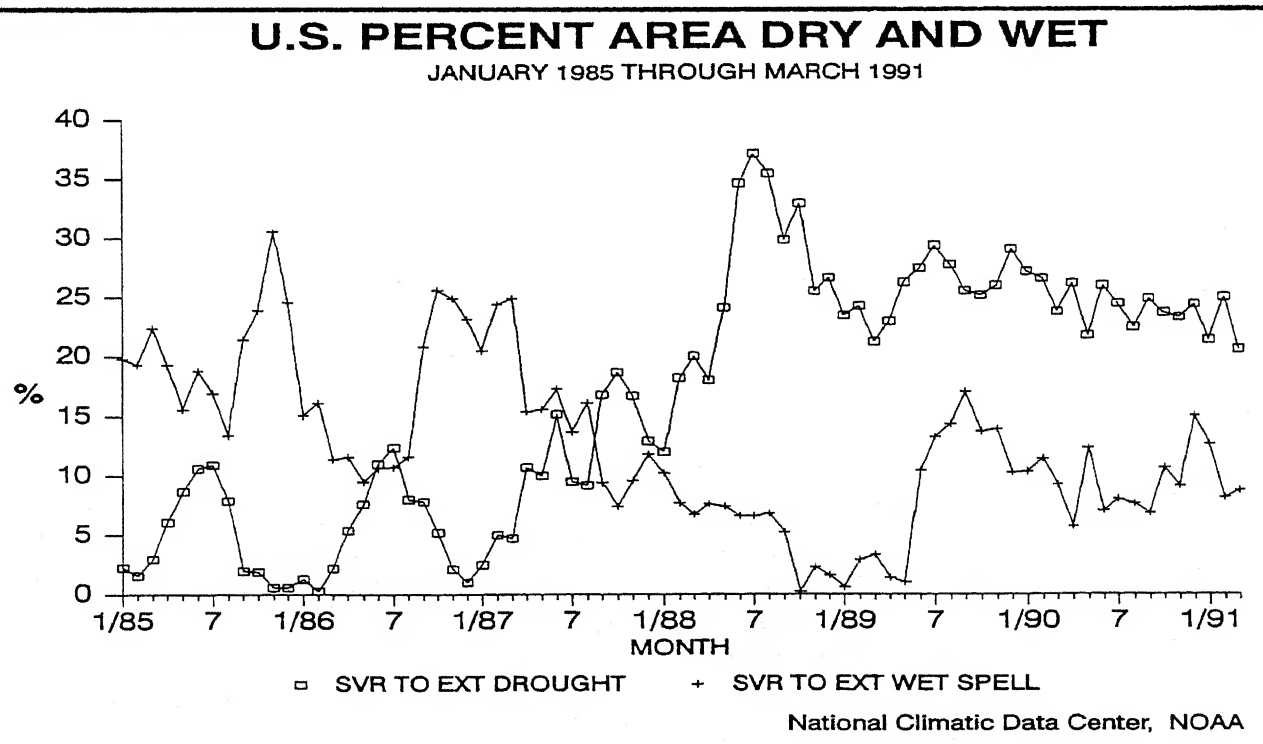


FIGURE 7: *Areal extent of United States covered by severe to extreme Palmer Drought AND severe to extreme Palmer wetness since January 1985. The areas enveloped by both extremes has remained fairly constant since late 1989, with around 25% of the nation suffering from excessive dryness and 10% of the nation experiencing abnormal dampness.*

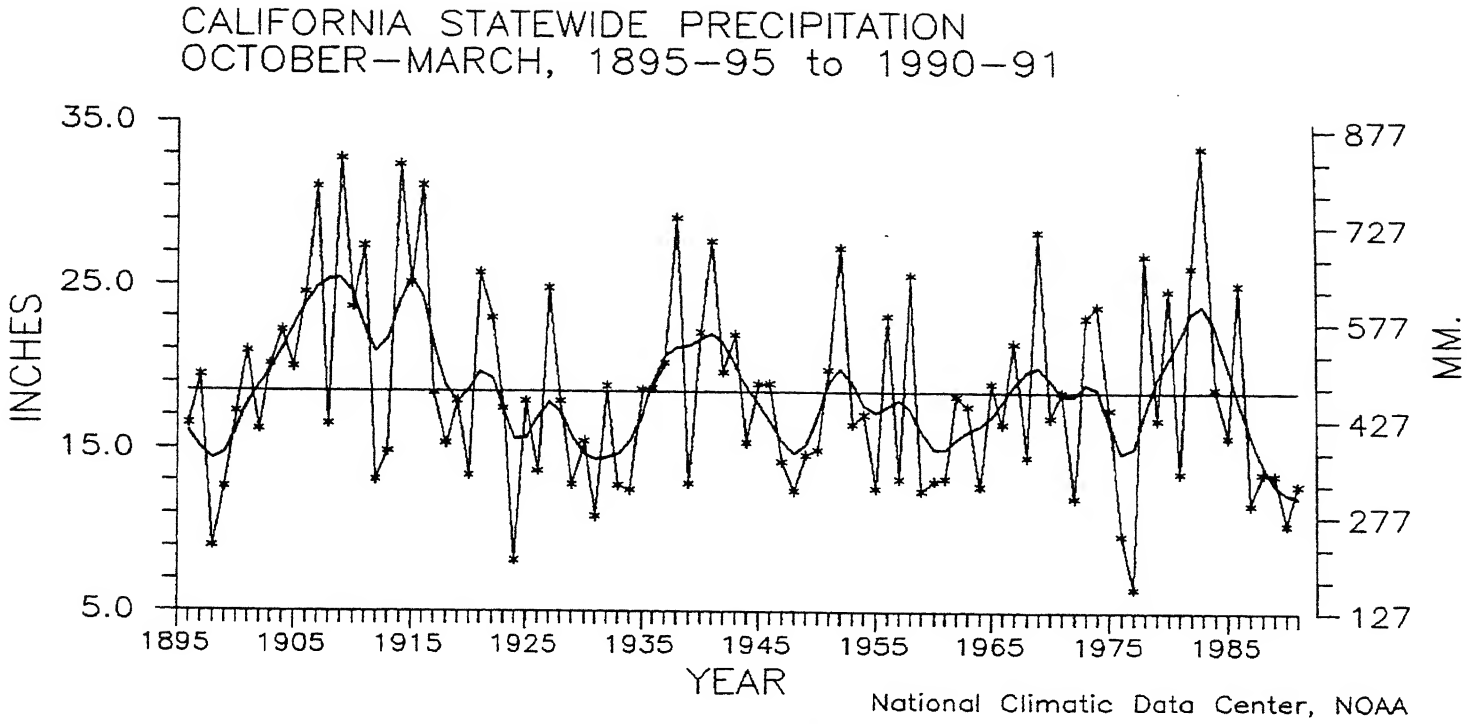


FIGURE 8: *California Statewide Averaged Precipitation During October–March from 1895–96 Through 1990–91. Despite exceptionally heavy March 1991 precipitation across most of the state, the extreme dryness of the October 1990–February 1991 period generated a fifth consecutive cold season with well below normal precipitation. Two consecutive cold seasons have not been as dry as 1989–90 and 1990–91 since 1975–76 and 1976–77, when near to above normal precipitation preceded and followed the two dry years, unlike the current situation.*

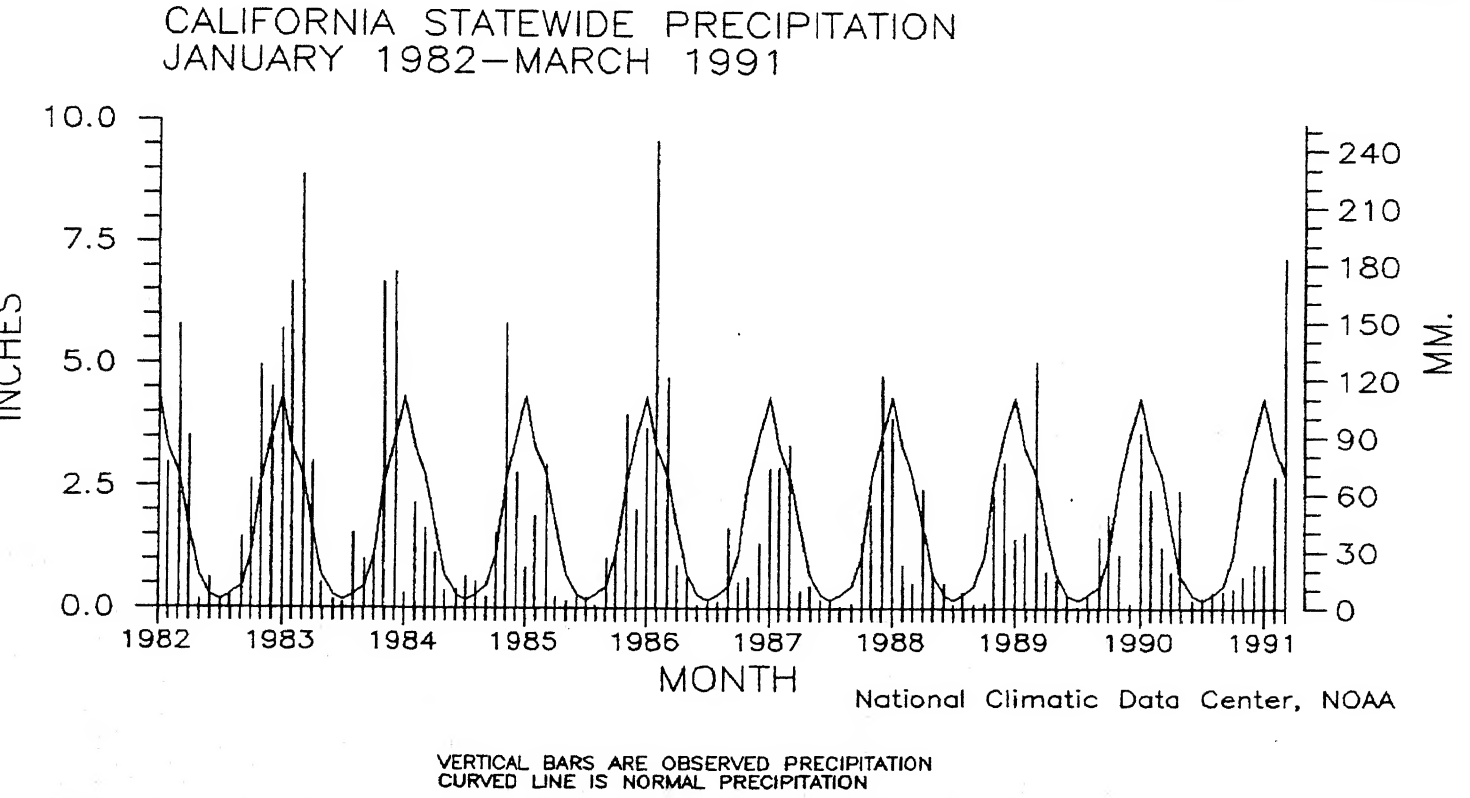


FIGURE 9: *Monthly California Statewide Averaged Precipitation, January 1982–March 1991. March 1991 was the first abnormally wet month since May 1990 and the wettest month since February 1986, helping but not nearly alleviating the current drought plaguing the state and adjacent areas.*

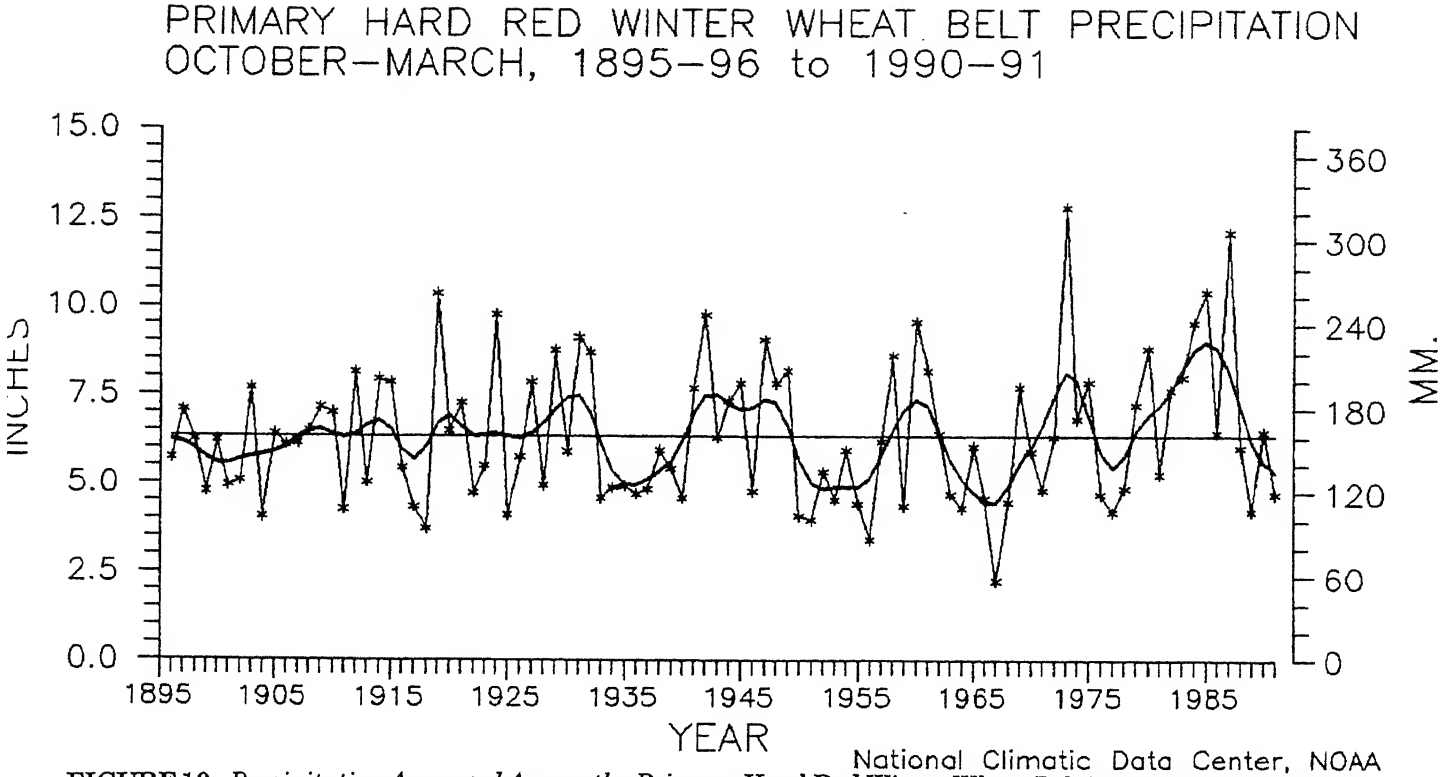


FIGURE 10: *Precipitation Averaged Across the Primary Hard Red Winter Wheat Belt During October–March, from 1895–96 through 1990–91. 1990–91 was the third of the last four winters to record below median precipitation in the Primary Hard Red Winter Wheat Belt, and was the second driest season since 1976–77. The binomially–filtered trend (solid, unspoked line) has been declining since reaching a maximum during the wet seasons during the early to mid–1980's.*

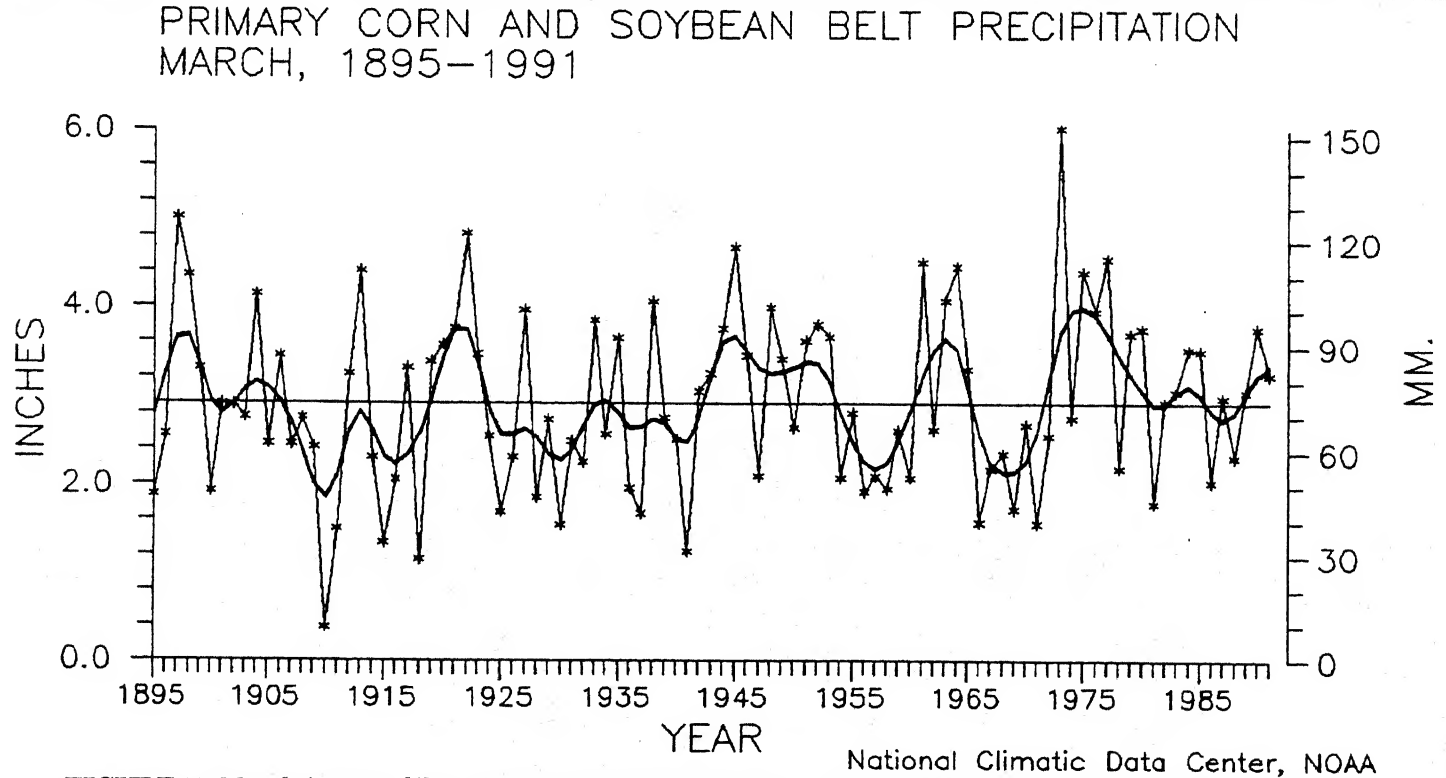


FIGURE 11: *March Averaged Precipitation Across the Primary Corn and Soybean Belt, 1895–1991. For the third consecutive year, slightly above normal precipitation has generated an optimistic start to the growing season.*

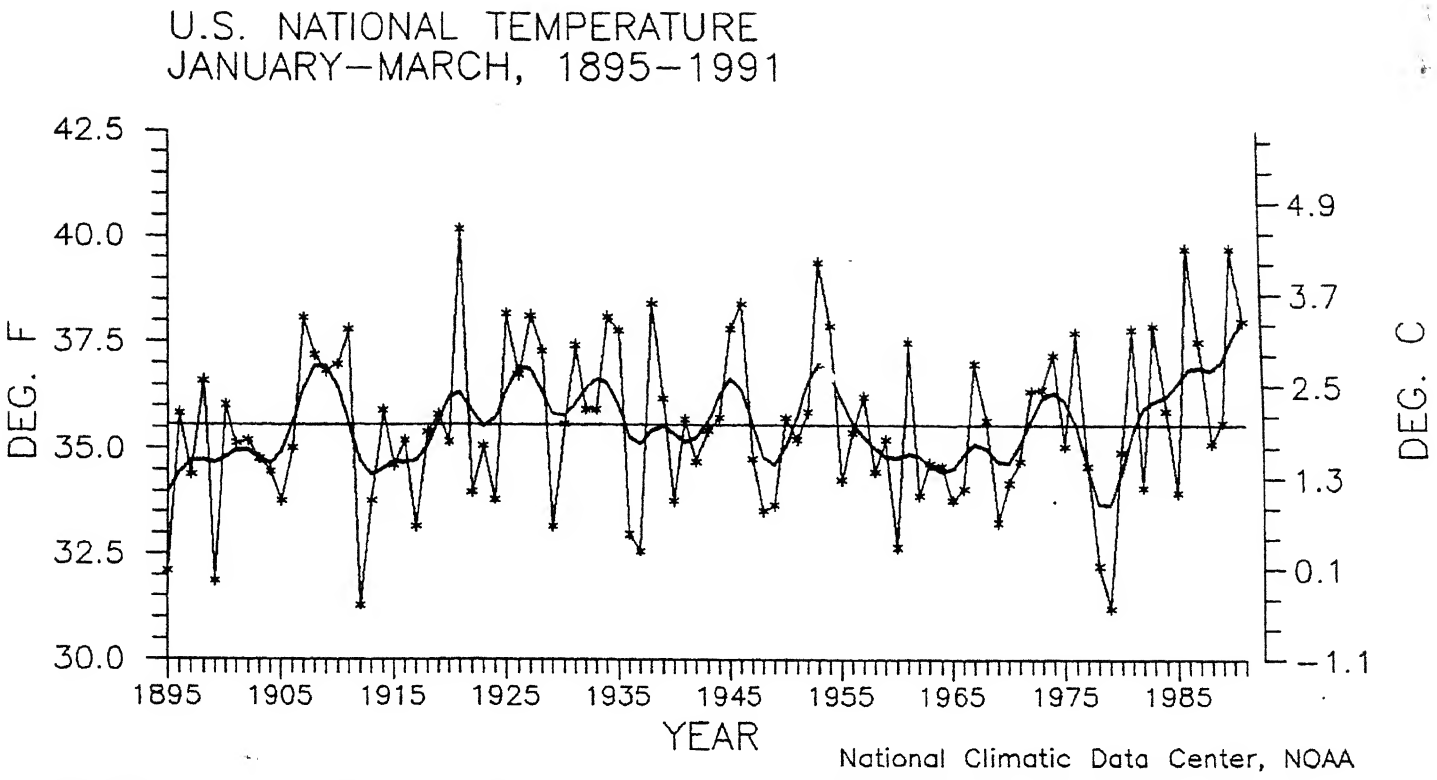


FIGURE 12: *January–March Nationally Averaged Temperatures, 1895–1991. The year has gotten off to an unusually mild start, but has been cooler than the record or near–record breaking warmth measured through the first three months of 1990, 1986, 1953, and 1921.*

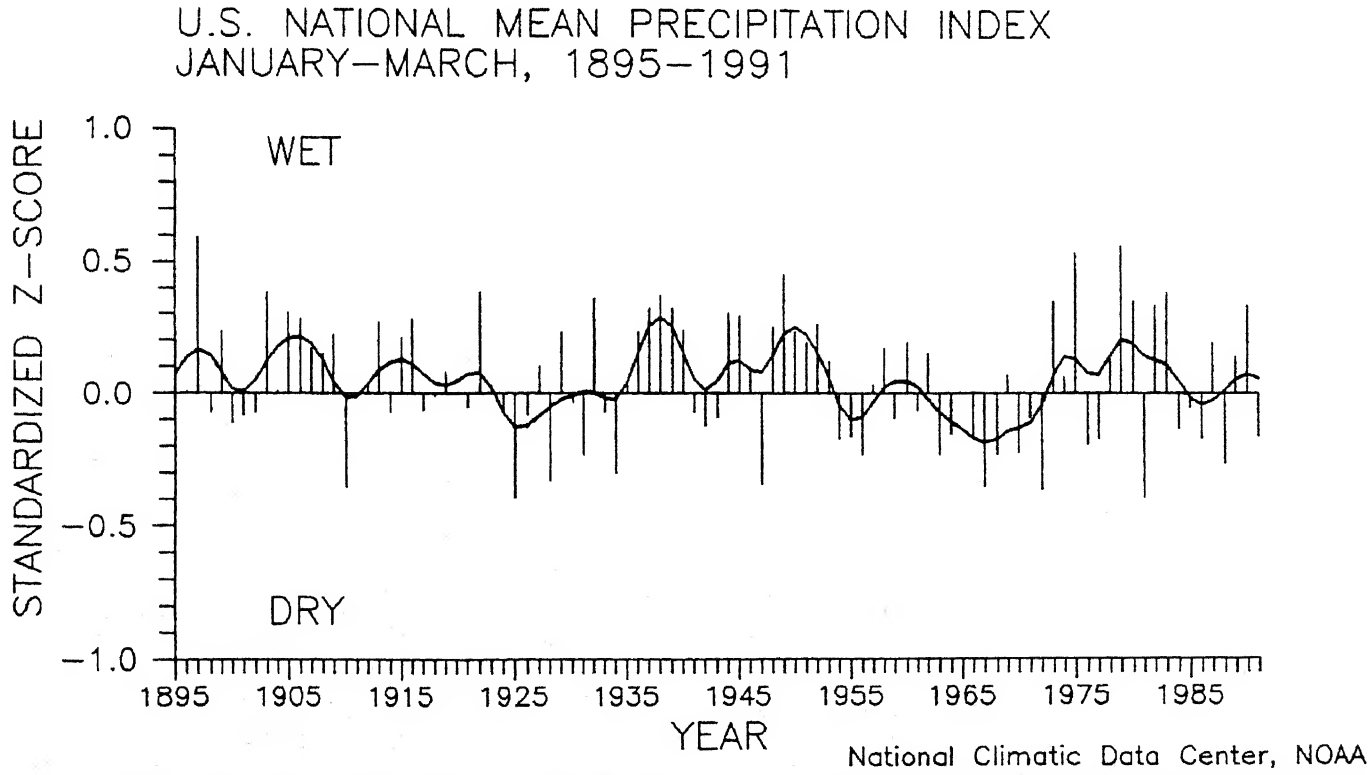


FIGURE 13: *January–March Nationally Averaged Mean Standardized Precipitation Index, 1895–1991. For the first time since 1988, the first three months of the year have seen below median precipitation at a majority of locations across the country. January–March 1991 was the second driest such period in a decade, exceeded only by the three months preceding the infamous Drought of 1988.*

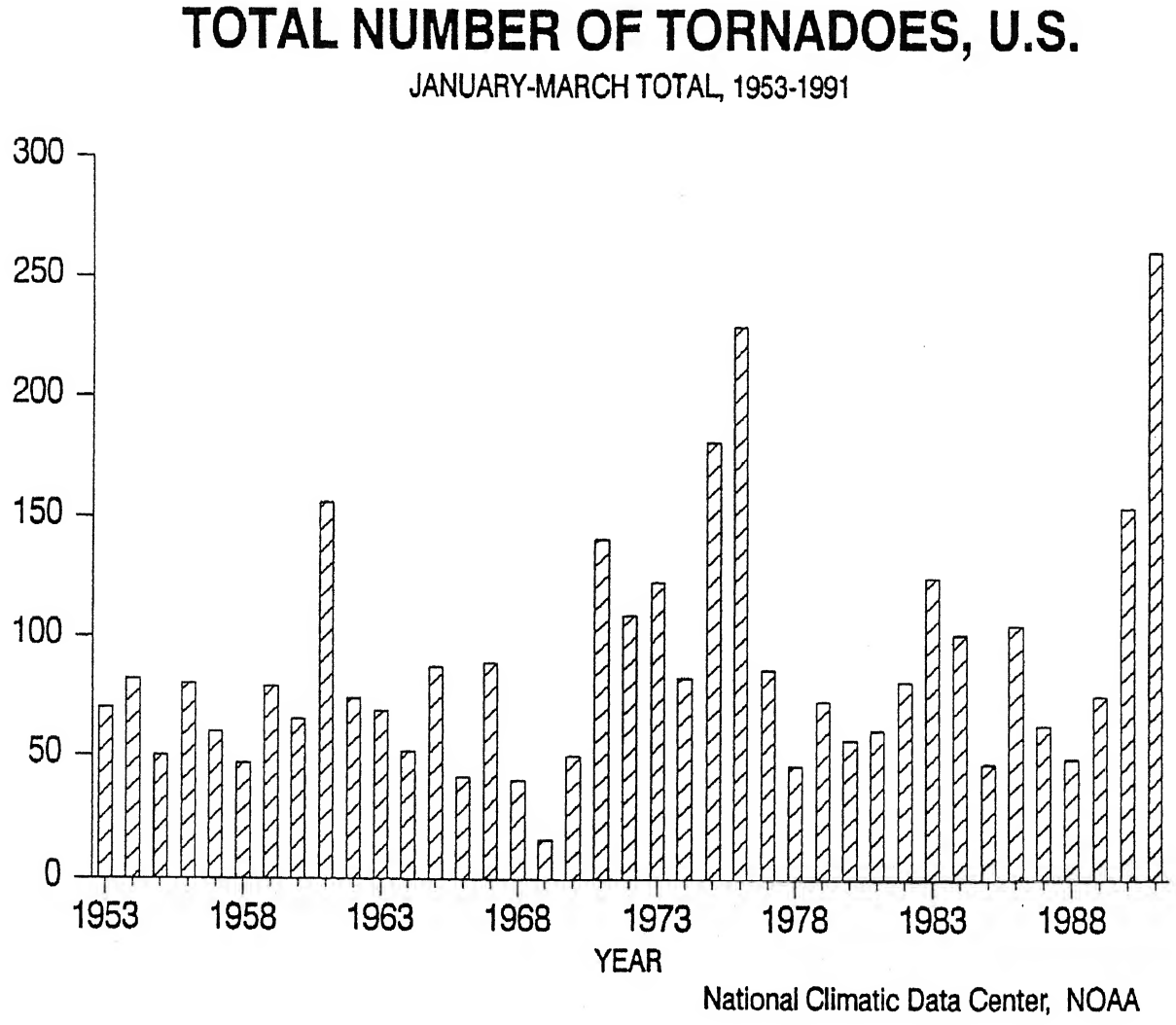


FIGURE14: *Total Number of Reported Tornadoes Across the Nation During January–March, 1953–1991. After a relatively tranquil February, March 1991 brought an exceptional rise in tornadic activity nationwide, helping January–March 1991 to become the most tornadically active start to a year on record.*

NCDC CLIMATE REGIONS